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Notes of the Month

TEXTILE RE-EQUIPMENT AND FUTURE

In his presidental address at the recent annual meeting of the Manchester Chamber of Commerce, Mr. Roland Thomas said that, in view of the many critical and usually uninformed comments such as, for example, that the cotton trade had had £30 million of the taxpayers' money, it should be made clear that what the Government had provided so far was £8·9 million. This was its contribution to the redundancy schemes for spinning, doubling and weaving. If the finishing trades had succeeded in qualifying this could become say £12 million and the balance of some £18 million—60% of the total—was a re-equipment contribution at the rate of 25%. If and when the total Goverment bill reached £30 million, added Mr. Thomas, the trade would have found some £54 million of its own money for re-equipment schemes. Re-equipment of this magnitude would indicate not only courage but also confidence that means would be found to operate the new machinery with the intensity necessary to make it pay. This meant 3-shift working.

"I suppose," continued Mr. Thomas, "that no trade has been more the prisoner of its own past than the cotton trade, hemmed in by traditional practices appropriate enough possibly in the vast days that are gone, but becoming more and more defensive and defeatist in the days of retreat. Nothing less in scope and imagination than the Government scheme could have forged a key to unlock that prison. But the bright light of freedom can for a time blind the prisoner long-immured and no one in his senses can expect an industry as old as this to be revolutionised in a day. A revolution in minds and methods is implied in any extensive re-equipment, and nothing less can succeed in solving the basic problem of competing in price, if not with the Far East, then certainly with the Western economies, and at the same time of competing in wages and other conditions of work with the many new industries starting up daily in the cotton towns."

"In the task of securing labour, wages are not the only thing that matters. Continuity of employment is equally important, especially in an industry where a bad reputation has to be made good. And only continuity of employment at a high level can make new machinery pay. An ebb and flow of demand affects almost every industry. It originates in natural causes beyond human control, and is exaggerated by alternating waves of confidence. For many reasons too well-known for me to detail here, the textile industries of the world suffer from these fluctuations more than most. Here in Lancashire I have no doubt myself that this lack of stability has been encouraged by the horizontal organisation of the industry. The last two years have provided a good example of fluctuation in demand for yarn and cloth out of all proportion to fluctuation in actual consumption."

"The traditional habit of 'blaming the merchant' for this state of affairs was as futile as it was facile," said Mr. Thomas. "The merchant converter might be the first, but he was not the only link in the distribution chain. His buying policy was guided by the reactions of his customers, at home and overseas, who were wholesalers, manufacturers, importers as well as retailers, and his initial indications of their demand were increasingly in small sampling lots rather than in bulk orders. When confidence changed, up or down, its effects were magnified at each stage back from the consumer. The natural answer was that the converter should offset these fluctuations by a cushion of stock, and this in fact he did, within the limits of his financial resources. Unfortunately his risks in doing this have increased greatly in recent years. Customers had succeeded in thrusting more and more of their own burdens on to his shoulders. The loss of export markets and increasing competition at home from imports had narrowed the field over which he spreads his risks, while much of what remains was influenced as never before by fashion. The affluent society (particularly the volatile teenage section of it) and the profusion of new textile fibres and blends had accelerated the pace of change enormously. In one respect only had the converter's problem been eased—he rarely needed to worry overmuch about the market price of cotton, except at times in Egyptian types. Variations nowadays seemed to be of relatively minor importance. Even this, however, had been more than replaced by variations in spinners' and weavers' margins, which had fluctuated wildly in recent years."

"It is unrealistic," said Mr. Thomas, "in these matters to talk about the 'duty' of the merchants to the producers or vice versa. Let us be quite frank and admit that the 'duty' of all in every section, if we intend to stay in business, is to make a profit, and in a private enterprise system each must be his own judge of the policies and conduct best suited to that end. My predecessor, Mr. Harrison, in his address last year, came to the conclusion that integration of the merchanting and production functions will prove a *sine qua non* of an efficient industry. Over much of the field I believe he is right. Except where very special circumstances exist I cannot see companies who are prepared to invest great sums in re-equipment, with all that that implies in faith that workers will be available on terms appropriate to twentieth century, not nineteenth-century conditions,—I cannot see such companies leaving the full employment of their assets to the free play of the horizontal system. They will not escape the risks inherent in merchanting by such integration—indeed they are almost certain to increase them,—but they may avoid the greater, and intolerable, risks of spasmodic and inadequate production.

Overriding all other doubts as to the viability of re-equipment is the question of the inter-industry limitation understandings with Hong Kong, Pakistan and India. One must not under-estimate the task of renewing a voluntary arrangement which was negotiated originally only with extreme difficulty. On the other hand, one cannot imagine H.M. Government failing to exert its influence in favour of renewal. To do otherwise would be the surest way to destroy the investment the Government has already made in the industry. Hong Kong interests believe that the undertaking has hurt them because while they were restricted, new competitors have invaded the U.K. market. It is true that in the exceptional circumstances of the past year, grey cloth has been imported from many new sources, but Hong Kong has itself contributed materially to this situation by the lack of limitation within the total quota, on finished and made-up goods. The rate of increase of finished cloth has been held down so far by the normal technical difficulties of a new industry, but imports of made-up cotton goods, particularly garments, have grown to an alarming extent. Concern about this situation is expressed in the recent annual report of the Chamber's Garment Manufacturers' Section. In the two years before the undertaking, the cloth equivalent of made-up cotton goods imported from the Colony was estimated to be 38 million sq. yds. annually. The estimate for 1960, based on the imports for the first ten months of the year, is 79 million sq. yds., or more than double.

"I think it is true to say that those concerned with the production of made-up cotton goods in the United Kingdom were not fully consulted when the arrangements were negotiated. The merchants and finishers, who gave their whole-hearted support to the producing sections in respect of the U.K. home market, pointed out at the time the dangers of thinking in terms of grey cloth alone. It was then felt that whilst it might offer temporary relief to the weavers, it afforded no protection to finishers, merchants and their customers and in the long run would undermine the position of the weavers themselves. In the event these fears are proving only too well-founded. An extension of the understandings, difficult though it may be to achieve, will be regarded with little enthusiasm outside spinning and weaving circles unless this time individual ceilings can be agreed for finished and made-up goods within the total figures. The spinners, who have so far been denied any limitation on duty-free yarn imports, may in any case urge with justice that a continued exclusion of yarns from the undertakings would be unfair and inconsistent with an effective re-organisation scheme. Meanwhile one might remind Hong Kong of the positive advantages she derives from these arrangements. The availability of a substantial share of the U.K. market in duty free goods must be worth a great deal in a very uncertain world. We might even see Hong Kong supporting Lancashire in demanding anti-dumping legislation that really works!"

LAUNDERING AND DRY CLEANING

THE laundry industry during the last few years has been faced with a gradual but continuous fall on the amount of family work. This has naturally resulted in an intensive study of ways and means of attracting new business, observes Dr. R. M. Robinson, B.Sc., Ph.D., (I.C.I. Ltd.), writing on "Laundering and Dry-Cleaning" in the "Review of Textile Progress" published by the Textile Institute and the Society of Dyers and Colourists in conjunction with Butterworths Publications Ltd. A recent survey in the U.S. showed that the number of conventional laundries had declined from 6,500 in 1954 to 5,000 in 1959. There were in addition, 15,000 - 20,000 hand laundries, 12,000 "neighbourhood" quick-service laundries and, in particular, 8,800 coin-operated automatic laundries, all of the last-named having been opened in the last three years.

The results of motivational research in America are now being acted upon there. In essence, they indicate the need for rapid services, both laundering and dry-cleaning requiring to be carried out in shops fitted with complete processing units. The need for fine presentation for publicity purposes and to inspire confidence in the customer has been emphasized. These trends are clearly in evidence in the U.K. with a rapid increase in the number of coin-operated launderettes offering drying facilities. Many of these units are being operated by the owners of the conventional type of laundry.

The labelling of textiles has been a subject for numerous discussions for a great many years, particularly in Europe. Perhaps because of the advent of the Common Market there appears to have been considerable progress in recent international conferences on the subject. In America 90% of housewives do home laundering and 80% of these use bleach regularly. Bleach is used to such an extent that 50% of all white loads are bleached. As many as 30% of the housewives use bleach fairly regularly on coloured articles

BRITAIN'S EXPORT EFFORTS

BRITISH wool top exports for 1960 failed by 5% to equal the post-war record set up the previous year, though they are still the largest for any country in the world. The relatively larger decline in wool imports into the U.K. last year is commercially considered to represent a correction of the stock situation and the industry is regarded as well placed to take full advantage of any improvement in demand. Wool imports into the U.K. during the calender year 1960 totalled 646·8 million lb. (actual weight), some 14% smaller than in the previous year though only 2% below those of 1958. Trade and Navigation accounts of the Board of Trade show that compared with 1959, last year's wool imports from Australia—the largest source of supply—were 20% lower; from New Zealand 5% lower; and from South Africa 25% lower. Wool consumption for 11 months of 1960 in the U.K. was about 5% lower than in the corresponding period of 1959, with a similar reduction in overall exports of wool products.

In an effort to open up the Soviet market for British wool cloth, the National Wool Textile Export Corporation is organising a comprehensive display of U.K. wool fabrics—the first of its kind—at the British Trade Fair in Moscow from May 19 to June 4. Its chairman, J. Douglas Hood, after a visit to Russia, says:— "The Russian people regard the Fair as a major event and there is no question but that they are much interested in our wool goods." Under the existing Anglo-Soviet trade agreement, British exports of consumer goods to Russia are quota-controlled and governed, in total, by the value of Russian consumer goods sent to the U.K. Russian quota for British cloth this year is the relatively small sum of £425,000—compared with total wool textile exports last year of £132 millions but British wool manufacturers believe the quota may be increased if Russian demand can be created. Twenty-three Scottish woollen manufacturers, representing nearly one-fifth of British wool textile exhibitors, will display several hundred cloths at the Fair. C. J. Ballantyne, president of the National Association of Scottish Woollen Manufacturers, said that this contribution to the exhibit would be possibly the biggest single effort made by the Scottish tweed industry at any overseas exhibition.

Physical Properties of Jute Warp Yarn in Relation to Weaving Performance (II)

In the first of these two articles (T.M. Oct. 1960, page 385) the authors reviewed the literature concerning the forces exerted on warp yarn during weaving, also the importance of certain characteristics of jute. This second part deals with the analysis of laboratory and mill data

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IN a previous communication[1] the stresses and strains encountered by the warp threads in the course of weaving and other operations have been discussed. The physical characteristics which enable the warp to withstand the disruptive forces set up in the loom and which form a useful basis for routine testing and quality control in the laboratory and factory, were also examined. In the communication now presented an attempt has been made to analyse these issues on a quantitative basis. Sizing forms an important step prior to the conversion of yarn into fabric and, further, the application of only small amounts of size helps the warp to better withstand the mechanical and frictional effects of the loom with consequent benefit to weaving; the changes in the physical properties of jute warp have therefore been studied in their relation to the warp breakage rate and production efficiency.

Smith and other workers[2-7] have emphasised the need for an engineering approach to studies of the performance of textile materials. The service performance of many materials used in engineering practice, such as those used in construction including iron and steel, can be predicted with some accuracy from a study of certain physical properties as, for example, tensile strength, elongation, toughness, fatigue resistance and so on. It has been suggested therefore, that the same basic concepts can be applied for comparing the behaviour of textile materials which are subjected to a stress. Here, however, complications arise because textile materials exhibit considerable visco-elastic effect even at relatively low stresses and, in addition, engineering materials are generally subjected to small deformation under service conditions whereas the reverse is often the case with textile materials. Despite these drawbacks, the load-elongation properties of fibres and their blends have been reported to provide considerable information on their behaviour. In the present paper, some of the properties have been defined in terms used in engineering practice and the load-elongation properties of the sized and unsized yarn have been examined from this standpoint.

The results which have been given represent a summary of data collected over the past fifteen years from 32 jute mills after the introduction of a scheme for a series of surveys on sizing and weaving practice conducted by the technical officers of the Indian Jute Mills Association Research Institute, Calcutta. This particular project required extensive laboratory testing of the physical properties of sized and unsized warp together with the recording of weaving results in the mill, the latter investigation including warp breakage rate during the weaving operation, production efficiency, and loom wastage figures.

At the initial stages of the surveys, it was found that considerable variation in the sizing formulation and its application existed at individual mills. Sizing formulations for jute should preferably be simple and only relatively small amounts of size are required because the issues of drape, handle and feel which are of considerable importance in the end uses for other natural and synthetic textiles are of secondary consideration for jute materials which are mostly used for heavy duty packaging and in industry. Also, many of the formulations in use were unnecessarily complicated and, in a number of cases, the individual components of the size mixture were found to be incompatible.

Control devices, either manual or automatic, for regulating the temperature and level of the paste in the sow box were either absent altogether or, when present, did not always function properly. The temperature for drying the sized warp and the steam pressure in the drying cylinders were not, in many cases, consistent with either optimum production or adequate drying. As a result, the warp was either undersized or oversized, under-dried or over-dried, and under-tensioned or over-tensioned. Since such uncontrolled variations can lead to processing difficulties and/or losses in production, the first phase of the survey was confined exclusively to reasonable standardisation of the sizing operation on a scientific and technically sound basis.

After a sufficient measure of regularity had been achieved, bulk trials

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on weaveability of the sized warp were undertaken and laboratory tests on the physical properties of the sized and unsized yarn carried out simultaneously. This method of operation was time-consuming but provided a good opportunity for examining the extent of change in certain physical properties of jute yarn on sizing and also a means for seeking any correlation that might exist between the laboratory and factory results.

Reports have appeared from time to time in which sizing compounds or formulations have been compared on the basis of one or other of the commonly tested physical properties of the sized yarn. A measure of success has been claimed by some workers in predicting weaveability from laboratory tests alone[8-12] but others do not subscribe to this view. It is, therefore, considered that more reliable results can be obtained by carrying out small scale weaving trials on miniature or dummy experimental looms which retain the principal tensioning and abrasion features of a commercial loom [13-19]. Even with such looms, the results seem to be qualitative rather than quantitative and at best only a ranking correlation between the laboratory and factory results can be obtained. The findings now presented are based on long term tests conducted on commercial looms and may, therefore, be of practical interest.

Procedure

A sizing formulation comprising a good quality tamarind kernel powder, which is extensively used by the Calcutta jute industry, a small amount of soda ash and an antiseptic, was used. No softener or filler material was added. The mixture was fed to the starch box and applied to the warp sheet by means of a copper coated lick-roller partly immersed in the size paste. The excess size was removed by pressure-adjusted flannel covered squeeze rollers, the warp dried over a series of steam heated cans at a steam pressure of approximately 30 lbs./sq. in. and finally wound on a warp beam prior to weaving.

It was found that under such conditions the size remains mostly as a coating film on the surface of the yarn and penetration of the size inside the yarn is relatively small. A relative low degree of penetration of size within the yarn appears to be desirable for jute since excessive penetration makes the yarn wiry and brittle as a result of which breakage rate at the loom is increased.

Bradbury[20] has observed in the case of cotton that the warp breakage rate varies with the amount of size deposited on the yarn and that there exists an optimum zone of concentration where the effect of the size on warp breakage rate is minimum. It is, therefore, considered that all weaving trials carried out for the purpose of assessing sizing efficiency should be confined to the optimum zone. In order to determine this zone for an 8 lb. hessian warp, several trials were carried out in which only the concentration of the size paste was varied and the other conditions were kept constant as far as possible. The sized warp was then examined for the breakage rate, production efficiency, and percentage of loom caddis. The results are shown in Fig. 1. It is seen

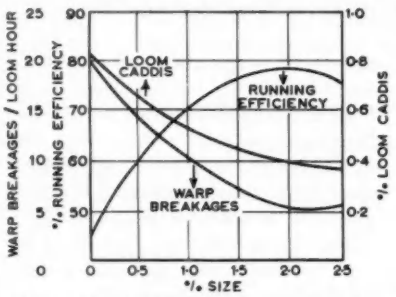

Fig. 1. Relation between size concentration and sizing efficiency

that when the concentration of the paste lay within the range of 1·8% to 2·5% the breakage rate as also the amount of loom caddis were at their lowest and the production efficiency at its highest. In the surveys on the sizing operation, the concentration was, therefore, maintained within this range.

Although it was relatively easy to maintain a constant sizing composition during the trial, it was much more difficult to keep under control the other factors connected with efficient preparation and application of the paste. Because of the uncontrolled variation, there was found a considerable difference in the breakage rate of even apparently similar warps. In order to attain some measure of reproducibility, it was necessary to carry out extensive weaving trials before the average breakage rate could be obtained[20].

It is very important in this connection to note that not all warp breakage is due to faulty sizing or sizing failure. Brown[21], for example, has listed eight separate causes of warp failure such as knots, impurities, chopped ends, abrasion, soft yarn, twisted ends, taped ends and unknown causes. The following classification of breaks for Florentine drill woven in an automatic loom has been provided.

Breaks which can be reasonably attributed to sizing = 24·7%
Breaks which are not connected with sizing = 41·6%
Breaks for which no definite causes can be given (although a substantial portion is apparently connected with bad sizing) = 33·8%

In carrying out the trials on sizing efficiency it was, therefore, considered desirable to maintain separate records of warp failure due to sizing and other causes. Such a system of classification presented some difficulty in practice since it requires considerable experience; moreover, some of the failures could apparently be put under two or more heads. Warp breakage due to size failure forms one of the major groups amongst the contributory causes and, therefore, the breakages along with the production efficiency and loom caddis figures have been taken as the basis for comparison of the sizing efficiency.

Table 1. Observation Chart

Loom No.	Date	Loom Stoppages Due to Causes Other Than Warp Breakages: Duration of Stoppages Hrs.	Min.	Causes of Stoppages	Total Weaving Time Hrs.	Min.	Total hrs. of Stoppages Hrs.	Min.
13	13.10.52.	0	10	Tugger changed				
	14.10.52.	0	4	Picking back	56	25	0	18
	20.10.52.	0	4	Martingale strap repaired				
14	13.10.52.	0	5	Loom belt repaired				
	14.10.52.	0	6	Tugger repaired				
	14.10.52.	0	5	Tugger changed				
	15.10.52.	0	5	Lifter adjusted	56	15	0	37
	15.10.52.	0	6	Lifter and swell adjusted				
	20.10.52.	0	10	Smash (20 ends) on both selvedges				
22	14.10.52.	0	10	Martingale strap repaired				
	16.10.52.	0	3	Camb sling adjusted	57	37	0	19
	17.10.52.	0	6	Picking back (bad cop)				
54	8.10.52.	0	7	Smash (bad cop) piecing ends				
	13.10.52.	0	27	Picking back (6¹) bad cop				
	14.10.52.	0	6	Loom belt adjusted	62	45	1	19
	14.10.52.	0	5	Picking back (bad cop)				
	16.10.52.	0	4	Box back adjusted				
	17.10.52.	0	30	Shuttle shaped, sized, bede polished and adjusted				

Weaving Tests

The following procedure was adopted in practice. Two per cent. of the total hessian looms in the shed or a minimum of 10 looms processing a particular type of fabric was selected; these were cleaned, oiled and generally serviced prior to the trial. The weavers selected were, as far as possible, representative of the mill and included both good and indifferent workers. Weaving was continued till the required numbers of beams had been woven into fabric.

Warp Breakage Rate.—The breakage rate was recorded by the coloured thrum method.[20] The weavers were provided with lightly tinted thrums and all warp breakages were mended with these thrums. The fabric was later inspected under a good light in order to record the number of breakages in a given length of the fabric. This method, which is reliable, could not, however, be followed in all cases because of practical considerations. In such cases, the weavers were given a chalk with which they kept records of breakage and the weaving overseer periodically noted the figures registered.

Single and multiple breakages were recorded separately. It frequently happened that rupture of a single thread automatically led to the breakage of several adjacent threads thus causing multiple breakages for which the size formulation could not directly be held responsible. All multiple breakages occurring in adjacent threads or within a short distance from each other were, therefore, counted as single breaks.

In addition to the time lost in mending the warp breakage, there are other sources of loss in working time and these include stoppage of the loom for re-shuttling, repairing weft breaks, minor repairs to the loom, changing of loom parts, and temporary absence of the workers. Records for such loom stoppages were maintained and a typical observation chart is given in Table 1.

Production Efficiency.—The production efficiency denotes the ratio of the actual production and theoretical production and is given by the following formula:—

$$\text{Actual production in yds. (directly observed from daily records of output per loom)} \times 100 \div \frac{\text{Picks per minute} \times 60 \times \text{number of running hours}}{\text{Picks per inch of cloth} \times 36}$$

It can be defined in three ways, viz. running efficiency, loom efficiency and shed efficiency. The first figure denotes the ratio of the actual output of a loom to the maximum output if the loom ran non-stop; in other cases, the loom may be stopped for no fault of the weaver such as extensive repair, lack of weft, gaiting up a new warp and where such losses are included the ratio indicates loom efficiency. It may also sometime happen that all the looms are not running due to various reasons and inclusion of such looms gives the shed efficiency, the order being running efficiency > loom efficiency > shed efficiency. In this communication, the production efficiency has been expressed as the running efficiency.

Loom Caddis.—This was estimated by weighing the droppings formed at the loom and estimating as a percentage on the weight of the hessian woven.

Laboratory Tests

These were carried out at an atmospheric condition of 70 ± 2% R.H. and 80° ± 4°F.

Grist or Count.—This was determined by running off 75-yd. hanks on a wrap reel and determining the average weight in pounds per spyndle of 14,400 yds.

Breaking Load—A Goodbrand 0 - 10/50 lb. capacity, motor driven, single-thread tester with a rate of traverse of 12 in./min. was used. The test length was 24 in. and the mean of 50 - 100 tests taken. The figures are expressed in lbs.

Quality Ratio.—Calculated from the ratio of breaking load to grist and multiplying the figure by 100. It relates the strength to the yarn weight.

Extensibility.—This was simultaneously determined along with the tensile strength in an autographic recording attachment fitted to the Goodbrand's machine. The recorder also provided the load-extension diagram of the yarn under test.

Ballistic Work of Rupture.—Provides a measure of the ability of the warp to withstand sharp stresses such as impacts or tugs and is based on ballistic principles, the energy required to break 10 threads being registered in in./lb. The average of 10 such tests was recorded in a Goodbrand machine capable of recording the ballistic work of rupture.

Abrasion Resistance.—This was determined on a Walker yarn abrader which operates on the principle of rubbing one portion of the yarn against another. The operation was done mechanically and the number of abrasion strokes recorded automatically in a counter. Forty-eight threads were tested under a tension of 50 grams and the average taken.

There are also other characteristics which are useful for determining yarn quality and performance. Those requiring special mention are irregularity as measured by the coefficient of variation of strength, weight, diameter or twist as also the number of weak spots present in a given length of the yarn when wound under a constant and known tension. Facilities for such testing were not available when the survey was started and, since only limited data were available for comparison, these have not been included.

In addition to the above properties which were directly evaluated by means of suitable instruments, the load-extension relation of sized and unsized jute yarn was used for calculating the stiffness and toughness figures. Smith[5] has proposed that these two properties can be evaluated respectively from the slope of the elastic portion of the stress-strain curve and from the area under the same curve. These concepts have been used in the present paper.

A typical load-elongation diagram for sized and unsized jute yarn redrawn from the Goodbrand's autographic recorder is shown in Fig. 2.

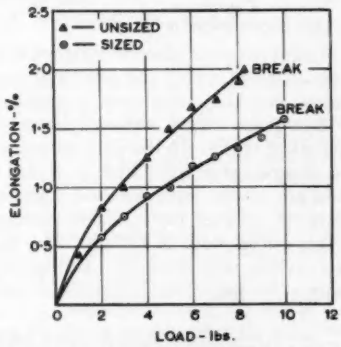

Fig. 2. Load-elongation diagram of sized and unsized jute warp

It is seen that the curves are almost linear being only slightly concave to the load axis. The extensibility is higher at the start owing to the fibre straightening, alignment and compacting, but then follows an almost linear course up to the point of break. Unlike many other textile materials, the yield point for jute warp is not far removed from the breaking point. As a practical approximation, the slope of a straight line drawn from the point of origin to the breaking point gives a measure of the elastic stiffness.

Stiffness has been expressed in four different ways,[5] namely, average stiffness, elastic stiffness, stiffness to any

Table 2. Comparative Physical Properties of Sized and Unsized Jute Warp Yarn

Breaking Strength (lb.)			Grist (lb./spyn.)			Quality Ratio (%)			Elongation at Break (%)			Toughness (lb./grist) ½ F/f. 1/L.			Stiffness (lb./grist) F/f. L/1 × 10,000			Ballistic Work of Rupture (inch/lb.)			Abrasion Resistance (No. of Strokes for Breakage)			Warp Breakage per 1,000 picks	Loom Efficiency (%)
Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Unsized	Sized	% Variation	Sized	Sized Yarn
7·08 ± 0·12	7·98 ± 0·15	+ 12·7	8·15 ± 0·1	8·52 ± 0·1	+ 4·5	86·9 ± 1·1	93·8 ± 1·2	+ 8·0	1·73	1·53	− 11·5	75·0 ± 2·1	71·6 ± 2·0	− 4·5	51·6 ± 1·7	62·8 ± 1·9	+ 22·0	20·4 ± 0·8	23·9 ± 0·9	+ 17·1	62·8 ± 4·4	85·5 ± 5·0	+ 36·1	0·97 ± 0·09	79·3 ± 0·8
Range 6·0 — 8·1	Range 6·7 — 10·7		Range 7·2 — 9·4	Range 7·8 — 10·1		Range 73·6 — 97·9	Range 80·5 — 107·5		Range 1·13 — 2·26	Range 1·01 — 1·92		Range 51·3 — 108·0	Range 49·5 — 97·9		Range 34·5 — 80·5	Range 42·8 — 97·5		Range 13·5 — 31·5	Range 16·5 — 36·6		Range 34·8 — 136·8	Range 51·9 — 166·1		Range 0·31 — 2·69	Range 70·2 — 89·5

given stress, and stiffness to any given strain. The average stiffness figure which is obtained from the ratio of breaking stress to breaking strain is equal to $\frac{F}{f} \times \frac{L}{l}$, where

F = the stress required to produce rupture expressed in lb.
f = grist or count expressed as lb. per 14,400 yards.
L = length of the yarn between the grips of the testing machine.
l = increase of length at the point of rupture.
The dimension is lb./grist.

Toughness can also be expressed in four different ways,[5] namely toughness index, breaking toughness, toughness to any given stress, and toughness to any given strain. In the data presented the toughness index which provides a measure of the work per unit fineness required to cause rupture if the stress-strain curve were a straight line has been taken into account. Mathematically, it has been expressed as, $\frac{1}{2} \cdot \frac{F}{f} \times \frac{l}{L}$, where F, f, L and l have the same significance as stated above. The dimension is lb./grist.

The comparative physical properties of sized and unsized jute warp are shown in Table 2. It is seen from the table that the sizing operation improves the strength and quality ratio of jute warp by about 10%; ballistic work of rupture, stiffness and abrasion resistance figures by 20 - 40%, whereas the elongation and toughness are reduced by 5 - 10%. The reduction in extensibility is due to the effect of tension imposed during beaming and to the cementing action of the size on the constituent fibres restricting their slippage under a load. The toughness, which depends both on the strength (which is increased on sizing) and on extensibility (which is decreased), shows on the whole a small reduction. Since toughness of the yarn is a desirable property in so far as its resistance to sharp tugs and shocks is concerned, it is necessary to retain the extensibility as far as possible and avoid excess tension on the yarn at the beaming and subsequent stages. The stiffness is also enhanced on sizing. A moderate increase of stiffness is desirable because in such a case wastage and breakage rate are reduced and the fibre-lay is improved. On the other hand, an excess of stiffness tends to make the warp wiry and brittle and the breakage rate is likely to be increased as a result.

The resistance of the warp to abrasive forces encountered in the loom is noticeably increased on sizing and this is reflected in the lower wastage figure and improved fibre-lay. In order to minimise the adverse effect of abrasion, it is necessary to maintain the reeds and healds, where the maximum abrasion occurs, in good condition otherwise full benefit from the sizing operation is not likely to be obtained. With a high percentage of size material it was found beneficial to incorporate small quantities of lubricants such as waxes, tallow or vegetable oils, at the rate of 5% to 10% on the weight of T.K.P. Excess should be avoided because incorporation of fatty matters in the paste tends to reduce its adhesive property. The application of waxes as a thin film on the surface of the sized and dried warp is likely to be more effective than its incorporation in the paste and seems to merit consideration from a practical standpoint.

The warp breakage rate and the loom efficiency figures showed considerable variation from mill to mill. Standardisation of the sizing technique and operation, almost without exception, resulted in a noticeable improvement both with regard to production and economy. The efficiency figure was in many cases lower than 80%, which figure has been taken as the target for running efficiency. It was apparent that apart from standardisation of the sizing operation, consideration must be given to other factors which can affect the production rate. These include adequate maintenance of the loom, selection of the batch composition, efficient workers, regular supply of weft, periodic check of the picking speed, and prevention of belt slippage.

Having examined the physical properties of the sized and unsized yarn in the laboratory and the weaveability of the sized yarn by bulk trials, it was then considered worthwhile to find whether there exists a simple correlation between the individual yarn characteristics as also between the individual characteristics and weaveability. The work involved extensive statistical analysis and the results obtained are summarised in Tables 3 and 4.

Table 3. Correlation Co-efficients Amongst the Individual Properties of Unsized Yarn
Significant value at 5% level = 0·3390

	Grist	Quality Ratio	Ballistic Work of Rupture	Abrasion Resistance
Tensile Strength	0·6483	0·6948	0·6447	0·3269
Grist	—	-0·0578	0·7298	0·1636
Quality Ratio	—	—	0·1720	0·2625
Ballistic Work of Rupture ..	—	—	—	0·1419

Table 4. Correlation Co-efficients Between the Individual Yarn Properties, Warp Breakage Rate and Loom Efficiency of the Sized Yarn: Significant Value at 5% Level = 0·3390

	Grist	Quality Ratio	Ballistic Work of Rupture	Abrasion Resistance	Toughness	Stiffness	Warp Breakage Rate	Loom Efficiency
Breaking Load	0·7782	0·7740	0·7936	0·3031	—	—	— 0·1730	— 0·0366
Grist	—	0·2271	0·7378	0·2470	—	—	0·0587	0·1540
Quality Ratio	—	—	0·5004	0·2289	—	—	— 0·3394	0·1507
Ballistic Work of Rupture	—	—	—	0·3204	—	—	— 0·1286	0·0338
Abrasion Resistance	—	—	—	—	—	—	— 0·0373	0·1938
Toughness	—	—	—	—	—	—	— 0·0730	— 0·1106
Stiffness	—	—	—	—	—	—	— 0·2450	0·2192
Warp Breakage Rate	—	—	—	—	—	—	—	— 0·6645

It is seen from Tables 3 and 4 that for unsized jute yarn a strong correlation exists between the breaking load on the one hand, and the grist, quality ratio or ballistic work of rupture on the other. The association with abrasion resistance is indefinite. The same findings also hold good for the sized yarn. These results would therefore, seem to justify determination of the breaking load for routine testing and quality control in jute processing operations. No significant simple correlation appears to exist between the breaking load, grist, quality ratio, ballistic work of rupture, abrasion resistance, toughness or stiffness of the sized yarn on the one hand, and the warp breakage rate or production efficiency figure on the other.

The results, so far available, indicate that although many of the physical characteristics that are used for routine testing and quality control in the laboratory or factory bear simple and significant correlation amongst themselves, none of these are significantly associated either with the warp breakage rate or loom efficiency. This conclusion is in general agreement with the results recorded for other textile fibres. The anomalies that appear to exist between the laboratory test results and weaveability have been discussed in more detail in the previous communication.[1] These anomalies are likely due to the large numbers of disturbing and possibly conflicting factors which mask the real effect of the individual yarn properties on weaveability. The findings also confirm the general belief that it is not possible to predict the sizing efficiency or weaving performance of a given composition or of a warp from laboratory tests alone. Final evaluation must eventually be based on practical bulk trials under the actual working conditions of the looms in the mill.

Acknowledgment

The authors thank the Research Director of the Indian Jute Mills Association Research Institute, for his keen interest in this project, checking the original proof, and for granting permission to publish the paper. They also thank Mr. R. N. De for assistance with the statistical calculations.

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Reviews

REVIEW OF TEXTILE PROGRESS, VOL. ELEVEN, 1959. 1960. The Textile Institute. Society of Dyers and Colourists. Butterworth and Co. (Publishers) Ltd. (price 60*s*.)

Since its first appearance in 1950 the Review of Textile Progress has been of progressively increasing importance to technologists, research workers and students, providing as it has done a critical review of textile and related developments grouped by subject and well indexed by name and topic. Those familar with the earlier volumes will do well to read carefully Mr. L. H. C. Tippett's introduction to this new issue. A new system of subject classification has been used resulting in the combination of some groups and modification of others. In certain sections of the industry there are generally insufficient developments to justify an annual critical review. For example, each year the review of yarn manufacture will concentrate on a particular spinning system and, if fabric production, weaving processes will be reviewed one year and preparatory processes the next year, so that eventually reviewers will be able to cover developments over a period of years. This annual concentration on more limited fields of textile invention and development may result in what has long been desirable, namely a more detailed description and assessment of innovations. Such amplification and criticism would be most useful to those lacking easy access to the cited literature, particularly from overseas, and also to others who, having such facilities, find language barriers difficult or even insuperable.

S.P.S.

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MANUAL OF COTTON SPINNING, VOL. II. PART I. E. Lord. 1961. Textile Institute, Butterworth and Co. (Publishers) Ltd. (price 45*s*.).

It is always a pleasure to see the published work of one possessing expert knowledge of, and long experience in, an industry. Such an author is Mr. Lord who has served B.C.I.R.A. for over thirty years and, having travelled in many cotton growing countries, has a mature judgment and knowledge of the needs and problems of all branches of that industry. This second volume of the Manual of Cotton Spinning has been written with the requirements of students in view, although it will give admirable service to more advanced readers. The plan of the book is explained in the author's introduction and is three-fold, the primary purpose being to describe the essential features of various testing techniques, for fibre structure, staple length assessment, maturity, fineness and mechanical properties, etc., so as to help both students and laboratory worker and secondly, to provide a background of information. To satisfy the latter requirement, some hitherto unpublished data have been included. Finally, Mr. Lord has included his comments and appreciations of the accuracy and difficulties of testing, on the interpretation of tests results and of the application of the tests in furthering quality control and cotton fibre property assessment.

S.P.S.

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SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1961. Thomas Skinner and Co. (Publishers) Ltd., 44 Brazennose Street, Manchester 2 (price 80*s*.).

The effects of the recent re-organisation of the British cotton industry are reflected in the new edition of "Skinners", over 200 mills having closed down. The arrangement of sections follows the now familiar pattern covering all branches of the industry from raw cotton to piece goods, with additional information on producers of man-made fibres, tufted textiles, non-woven fabrics and linen, flax and jute. Seventy-five countries are included in the Overseas Section. Two perennially useful lists are those containing over 5,000 trade names and mill requirements classified under some 700 headings.

S.P.S.

Box-Chain Making for Dobcross Looms (III)

A good chain maker has some consolation and satisfaction in the knowledge that the time and thought he puts into his work can ease and expedite the work of the weaver and overlooker to a considerable extent

By N. C. GEE, F.T.I.

A THREE-SHUTTLE box-chain plan is given in Fig. 1 which will serve several purposes:—

(1) When used with wefting plan A and with one colour of weft it may be used as a weft mixer.

(2) With wefting plan B and similar warping to give a weave and colour effect.

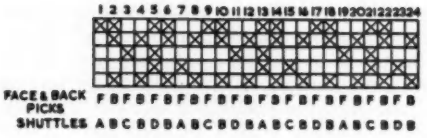
(3) Used with a 1/1 double cloth and wefting plan C it would give a 1/1 effect on the face and a solid colour on the back. Similar warpings to weftings would, of course, be used in each example.

These three weftings are given to illustrate the usefulness of this short and simple chain, which as will be seen from the boxing plan (Fig. 2) has no double moves, is perfectly balanced, and is easy to follow by the weaver. Fig. 3 shows the shuttle positions at the start. Other weftings and colourings can be used with it.

The box-chain plan, given in Fig. 4, is a further excellent example of a weft mixing arrangement suitable for a 1/1 double cloth (Fig. 5), or a 1/1 weft-backed cloth (Fig. 6). For example, with wefting plans D and simple modifications E, F and G, it could be used to give any of the following:—

Fig. 3

Fig. 4



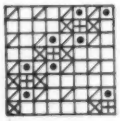


Fig. 5

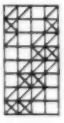


Fig. 6

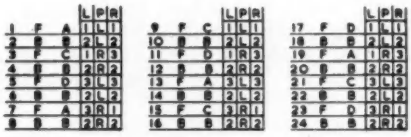


Fig. 7

Wefting Plan A

Shuttle A	..	1	-	Complete on 4 picks
„ B	..	1	1	One colour of weft in all three
„ C	..	1	-	shuttles

Wefting Plan B

Shuttle A (Light green)	..	1	-	Complete on 4 picks
„ B (Dark green)	..	1	1	
„ C (White)	..	1	-	

Wefting Plan C

Shuttle A (Dark slate)	..	Double Cloth 1 Face	Complete on 4 picks
„ B (Saxe blue)	..	1 Back 1 Back	
„ C (Light grey)	..	1 Face	

(1) A solid colour cloth with the same wefts on both back and face. Shuttles A, B and C giving three odd picks on the face, and shuttle B

Wefting Plan D

Shuttle A	..	1	-	Wefts all one colour
„ B	..	1	1	Complete on 6 picks
„ C	..	1	-	
„ D	..	-	1	

Wefting Plan E

Shuttle A (Dark grey)	..	F	1	-	Complete on 6 picks
„ B (Light grey)	..	B	1	1	
„ C (Dark grey)	..	F	1	-	
„ D (Dark grey)	..	F	-	1	

the solid colour on the back. N.B.—The face of the cloth is generally more important than the back, the latter in many cases is not seen when the cloth is made up and any slight imperfection is, therefore, not so important. Assuming shuttles A, C and D all inserted dark brown weft, and B fawn weft, the woven cloth would have solid dark brown on the face and solid fawn on the back. Warping should be as wefting plan D.

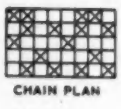


Fig. 1

Fig. 2

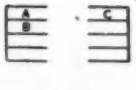


Fig. 8

Fig. 9

Fig. 10

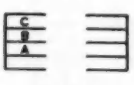


Fig. 11

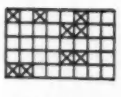


Fig. 12

(2) A reversible two-colour cloth, with say dark grey on the face, and with shuttles A, C, and D giving three odd pick mixing, and shuttle B with say light grey on the back (see wefting plan E).

(3) A three-colour cloth, with 2/1 colouring on the face, say 2 dark blue (shuttles A and C), 1 medium blue (shuttle D) and a solid colour lichen green (shuttle B) on the back (see wefting plan F).

(4) A four-colour cloth, say 1 blue grey, 1 purple navy, 1 clove brown (shuttles A, C and D) on the face, and 1 powder blue (shuttle B) on the back (see wefting plan G).

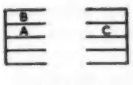


Fig. 13

Fig. 14

Fig. 15

The chain plan (Fig. 4) is shown on 24 pins, and although 24 picks are required to get the shuttles home, the shuttling order is complete on eight picks, and only eight pins are needed for the box-chain, whereas the wefting plan D is on six picks. Therefore, four repeats of the wefting order and three repeats of the box-chain have to be made before the shuttles regain their starting positions.

This may be seen by noting the arrangements of the boxing plan (Fig. 7), and the plan of the shuttle

Fig. 16

Fig. 17

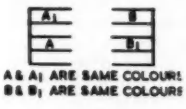


Fig. 18

Fig. 19

starting positions at Fig. 8. Having only eight picks in the round, the weaver can soon memorise the shuttle running and she will also appreciate the fact that as the chain has no double moves, it is fairly easy to watch.

Two Picks from Each Shuttle

When maximum weft mixing is desired the insertion of odd picks, as previously shown, is usual and from two to five odd picks may be used depending on the degree of shadiness to be overcome. Some firms regularly use three odd pick chains for all solid coloured cloths as a precaution against shadiness and, when it is severe, more shuttles are used. But when chains of more than three odd picks are used, double moves cannot be avoided. However, in many cases weft mixing by the insertion of two picks from each of two shuttles is sufficiently effective to obtain "level" pieces. Fig. 4, in a previous article (T.M., Oct. 1960, p. 392) illustrated this method of wefting.

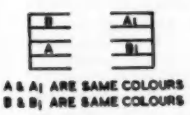


Fig. 20

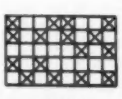


Fig. 21

Wefting Plan F

Shuttle A	(Dark blue)	..	1	-	-
„ B	(Lichen green)	..	1	1	1
„ C	(Dark blue)	..	1	-	-
„ D	(Medium blue)	..	-	1	-

Complete on 6 picks

Wefting Plan G

Shuttle A	(Blue grey)	..	1	-	-
„ B	(Powder blue)	..	1	1	1
„ C	(Purple navy)	..	1	-	-
„ D	(Clove brown)	..	-	1	-

Complete on 6 picks

Wefting Plan H

Colour A	.. ..	2
„ B	.. ..	2
„ C	.. ..	2
„ D	.. ..	2

8 picks in one repeat

Wefting Plan I

Colour A	.. ..	2
„ B	.. ..	2

4 picks in one repeat
2 shuttles on each colour

Wefting Plan J

Colour A	.. .. ..	6
„ B	.. .. ..	2

8 picks in one repeat of the colour plan
3 shuttles on Colour A, 1 on Colour B

Wefting Plan K

Colour A	.. .. ..	4
„ B	.. .. ..	4

8 picks in one repeat of the colour plan
2 shuttles on each colour

Wefting Plan L

Colour A	.. ..	1
„ B	.. ..	1

2 picks in one repeat
2 shuttles on each colour

Wefting Plan M

Shuttles A and C	Black	..	4	1
„ B and D	White	..	4	1
		Picks	24	32

Complete on 56 picks
2 shuttles on each colour

Wefting Plan N

Green	..	54	10	-	10	100	10	-	10	54	=	248
Scarlet	..	6	100	100	6	6	100	100	6	-	=	424
Yellow	..	-	6	-	-	-	-	-	-	-	=	6
White	..	-	-	-	-	-	6	-	-	-	=	6

Complete on 684 picks

Wefting Plan O

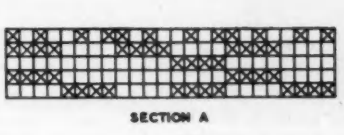
Shuttles A and C	Dark blue	..	4	2
„ B and D	Cream	..	4	2
		Picks	32	48

Complete on 80 picks
2 shuttles on each colour

Another simple chain giving two picks from three shuttles is shown on eight pins in the boxing plan (Fig. 9) and the box-chain plan (Fig. 10). In this example the wefts are inserted in the order of two picks from A shuttle, two picks from B shuttle, two picks from C shuttle and two picks from B again. As all the shuttles start from the left, each one in turn appears in the top box on the right, which is advantageous to the weaver. The mixing of the weft is not as good as it would be if the chain was on six picks instead of eight—actually half the picks in one repeat of the wefting are from shuttle B—but the wefting is easy

(left) Fig. 22

(right) Fig. 23



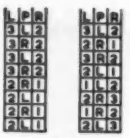


Fig. 24

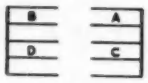


Fig. 25

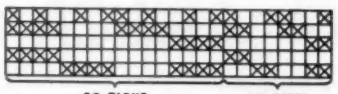


Fig. 28

Fig. 29

FIRST 8 PICKS

LAST 8 PICKS OF FIG. 28

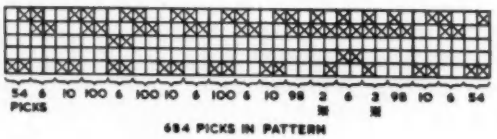


Fig. 26

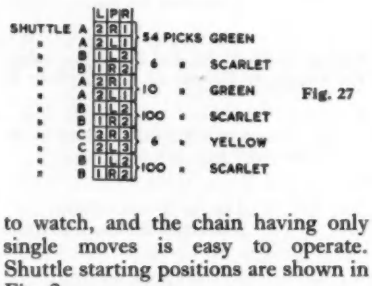


Fig. 27

to watch, and the chain having only single moves is easy to operate. Shuttle starting positions are shown in Fig. 2.

In the boxing plan (Fig. 14), two picks in turn are taken from shuttles A, B and C, and six pins only are required for the box-chain, but there is a double rise—with the shuttle picking in—once in every six picks (see Fig. 12). The shuttle positions are shown in Fig. 13.

One of the most useful and versatile box-chains, having the advantage of single moves, is given in Fig. 15, with its boxing plan (Fig. 16) and plan of shuttle positions at Fig. 17. Besides being a four-shuttle two-picks-from-each-shuttle weft mixer for wefts of one colour, it can be used for wefting plans H, I, J and K together with the shuttle starting plans at Figs. 17, 18, 19 and 20 respectively.

The shuttles in each example must be placed in the boxes correctly, as indicated by the starting plans, and the chain placed on the lag cylinder so that the first pick made by the loom will be that of pick 1 in the box-chain, and this must also be opposite the first lag of the pattern chain. A pick-and-pick arrangement can also be obtained for two colours by using the shuttle positions in Fig. 18 with two shuttles on each colour as for wefting plan L together with box-chain (Fig. 21) (see boxing plan, Fig. 22).

Box Chains for Block Checks, etc.

Shuttle position (Fig. 18) can be further used for block checks by combining wefting plans K and L and repeating each section a number of times. Large checks for travelling rugs, overcoatings and suitings are produced with such weftings when combined with suitable warpings. If the warpings and weftings are identical the checks are usually square, if the warping is on a smaller number of threads than the wefting, the checks are rectangular. The combination of wefting plans K and L result in wefting plan M and this used in conjunction with box-chain plan (Fig. 23) produces a weave and colour check on 56 picks (see first eight picks and last eight picks in boxing plan, Fig. 24).

Tartans and similar patterns with various colours are regularly made on even picks in multiple weftings. With four-colour tartans, the arrangement of shuttle placing in the first and third boxes at each side of the loom is very convenient. Wefting plan N is a typical example, and the shuttle position plan, box-chain plan and the first 12 picks of the boxing plan are given at Figs. 25, 26 and 27 respectively.

Wefting plan O shows a minor modification of wefting plan M and gives a 2/2 wefting in section B in place of the 1/1 wefting. This wefting can also be used in conjunction with shuttle position (Fig. 18) together with box-chain plan (Fig. 28) and boxing plan (Fig. 29). Careful planning for this type of wefting is essential and the good chain maker always has the satisfaction of knowing that the time and thought that he puts into his work can ease and expedite the work of the weaver to a considerable extent.

(To be continued)

New Books

THE INDUSTRIAL REVOLUTION IN COVENTRY. John M. Prest. Oxford University Press, Amen Court, Warwick Square, London, E.C.4. (price 21s.).

Life in early nineteenth century Coventry had several unique features. The political rulers of the ancient city prevented urban expansion by their refusal to allow building development on the spacious surrounding pasture lands, thus providing ideal conditions for the survival of old trade customs. In consequence, the silk ribbon weaving industry, in common with most other industrial and municipal activities, was well behind the times and innovations were not welcomed. Nevertheless, technical improvements, competition from home and overseas and political changes led to the introduction of power-weaving of ribbons and to the establishment of "cottage-factories" by the better-class of weavers who worked by power in their own homes. Such home-factories were built in Coventry on a scale unequalled elsewhere. Bitter competition between factories and cottage-factories ensued, only to be ended when the anglo-French Treaty of 1860 allowed entry of French ribbons duty-free, thus causing the collapse of the trade and the ruin of the cottage-factories. Much of this book is based on the lives and writings of four Coventry people, viz. George Eliot, the novelist; Charles Bray, ribbon manufacturer; a weaver, Joseph Gutteridge; and William Andrews, who accomplished the feat of rising from apprentice to master during a period when even mere survival came only to the most efficient.

* * *

PORE SIZE OF FABRICS AND DETERMINATION OF SEAM SLIPPAGE OF WOVEN FABRICS (B.S. 3321 : 1960 and B.S. 3320 : 1960). British Standards Institution, British Standards House, 2 Park Street, London, W.1. (price 3s. each).

These new standards, the result of collaboration between the Textile Institute and the British Standards Institution, are based on tentative Textile Standards Numbers 59 and 55. B.S. 3321 describes a procedure, particularly applicable to water-repellent and filter fabrics, for measuring the equivalent pore radius, which provides an estimate of the interstices in all types of fabric which are permeable to air. The principle of the test is based on the observation of the pressure required to force air bubbles through the interstices of a wetted fabric. This pressure, together with the known surface tension of the wetting liquid, is used to estimate the size of the interstices. B.S. 3320 lays down a method of assessing the liability to slippage of a fabric at a seam, under standard conditions of seaming and stitching. (Slippage may be caused by the structure of the fabric itself, the type of seam used or the conditions of stitching). This method is intended particularly for clothing, household and furnishing fabrics; it is not suitable for heavy industrial fabrics, such as belting.

Active Centenarian

An account of the growth and enterprise of Holdsworth and Gibb Ltd., a famous Lancashire spinning and manufacturing company, founded in 1860

By S.P.S

THE writing of business history, both for its own sake and for the part it can play in furthering the reconstruction and understanding of economic and social history, has quite rightly received greatly increased attention in recent years. Likewise, the importance of the careful preservation of business archives has been more widely emphasised as being vital source material to be examined in the necessary research involved in such writing. But business records alone furnish, in many cases, rather arid and lifeless accounts unless they are augmented and illuminated by human reminiscence and observation. The anonymous author of the history of Holdsworth and Gibb Ltd., Moorside Mills, Swinton, has chosen a wise course and, in consequence, the reader is given a balanced account of a lively veteran, not an industrial giant but a well-developed and healthy middleweight which, despite the diminution of the spinning and weaving capacity of the Lancashire cotton industry over the past forty years or so, has actually greatly expanded during that period.

The firm was established as Holdsworth and Gibb in 1860 and was incorporated as a limited company in 1877. Mr. Walter Gibb, one of the founders, was also one of the original Board of Directors and, until his death in 1935, his son, Mr. J. F. Gibb, was chairman of the company. The familial nature of the company is further illustrated by the facts that the present chairman and managing director is Mr. John S. Wood, M.A., who succeeded his father, the late Mr. Norman S. Wood, whose forebears were founder directors and that, throughout the years, descendants of the original Holdsworth and Gibb have been shareholders of the company. It may well be that this family thread gives the history its readable and friendly character, for to be known by the acronym "H. and G." suggests respect and goodwill. We are also told, for example, of the services to the company of Mr. Harold Brighouse, the novelist and playwright. Mr. Brighouse, author of *Hobson's Choice*, made frequent reference to the company in his autobiography, published in 1953. Similarly, the work of humbler members of the staff is recognised and recorded, and the company gains some reflected glory by numbering among its pensioners the grandfather of one of England's opening batsmen.

There are many revealing sidelights on mill life during the company's existence and on the periods of prosperity and stress which have influenced its progress. Examples of the company's early awareness of the social responsibilities implicit in ownership are the provision of food for the workpeople in 1910 and the simultaneous inauguration of an Accident Fund.

"H. and G.'s" main products over the years have been single and doubled yarns in coarse counts, fancy yarns, yarn dyeing and bleaching, and the manufacture of garden furniture canvas, deck chair and awning cloths and various speciality types of canvas such as filter cloths for the dyestuffs, oil and gold mining industries. Canvases and other cloths produced at Moorside Mills can be seen all over the world.

The spinning and doubling departments comprise the largest sections of the firm, each producing approximately 85,000 lb. of yarn per week. Counts vary between 1s and 20s and yarns are produced for moquettes, candlewick (tufting), furnishing fabrics, towels, duckcloths and many other purposes and the total variety of fancy yarns such as gimps, spirals and corkscrew slubs now runs into several thousands, incorporating man-made fibres as well as cotton. A great asset to the firm has been its dyehouse with its current production of over 40,000 lb. per week.

The growth and present condition of the various departments are fully described and there are numerous photographs and exceptionally fine coloured illustrations of the firm's plant and products. In addition there are a number of graphs showing at a glance the remarkable increases in production over the past thirty years in the spinning, doubling, weaving and dyeing departments and the total number of employees, the last-mentioned having a 40% increase over 1930, despite the steady and perspicacious introduction of the most modern machinery and methods.

At one time, smoke emission was regarded as a visible index to the Lancashire cotton industry's prosperity. In wishing "H. and G." well as the firm enters its second century we are tempted to say "Long may your lum reek," but that might be regarded as contrary to the spirit of the Clean Air Act.

An aerial view of Moorside Mills, Swinton

Winding Tension

In this, the second of four papers presented at a special conference held recently in Bolton Technical College, the author deals with power required in ring spinning, package power, spinning power, choice of winding tension, economics of spinning at the lowest possible tension, other factors, and the effect on yarn properties

By H. CATLING, B.SC., A.M.I.MECH.E.*

WINDING tension so far as this article is concerned may be defined as the tension existing at any instant at the point at which the yarn makes contact with the surface of the package and it is responsible for a substantial fraction of the total power required in the ring spinning process. Before considering winding tension in detail the general pattern of ring spinning power requirements should be appreciated.

Power Required in Ring Spinning

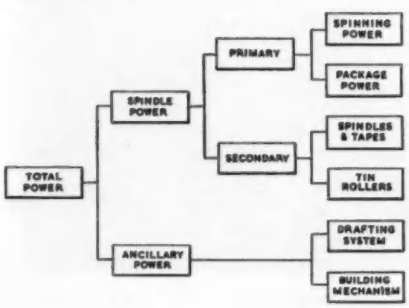
Total ringframe power can conveniently be divided into six physically separable components under two main headings as shown in Fig. 15. Ancillary power is usually small and independent of the spinning or twist-insertion process and most of the power is accounted for under the heading of spindle power, which is further subdivided into primary and secondary spindle power.

This subdivision is an important one distinguishing the basic power required to rotate the package and the yarn balloon from the power losses incurred in the mechanical components employed to support and rotate the package. The relationship between the primary spindle power and the total spindle power can be regarded as being a measure of the mechanical efficiency of a ringframe. With conventional arrangements it is usually between 30% and 40%.

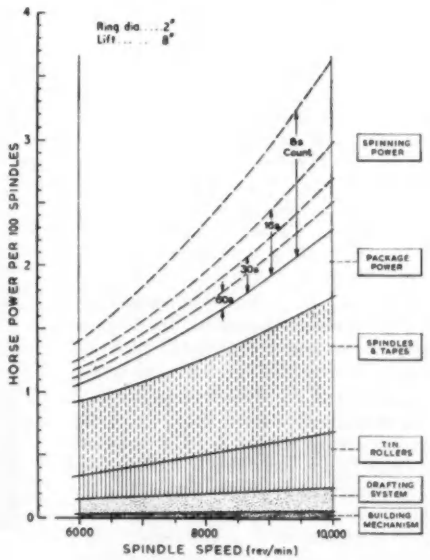
Primary spindle power involves only two components: Package Power and Spinning Power. The former is required to overcome air-drag between the package and the ambient air. Spinning power is a little more complex as, in addition to work done against air-drag opposing the rotation of the balloon and frictional resistance to the rotation of the traveller, it includes work done against friction between the yarn and the traveller, and between the yarn and the thread guide, work done by the yarn tension at the roller nip assisting the rotation of the front rollers and a smaller component concerned with changes in the kinetic energy of yarn elements during spinning. This somewhat formidable list of components is considerably simplified by the fact that, for our purposes, the net spinning power at any instant is the product of winding tension and package surface speed at the point of winding at that instant.

The relative values of the various power components and the way in which they increase with increasing speed is shown in Fig. 16 for a typical modern ringframe. At first sight the rate of increase of power with speed may seem alarming but the fact that the rate of production increases directly with speed must also be taken account of and in most instances proper costing will show that the highest practicable spindle speed is the most economical speed. Package power is, of course, substantially independent of count but spinning power increases rapidly with decreasing count—when spinning 30s the spinning power is of the same order as the package power

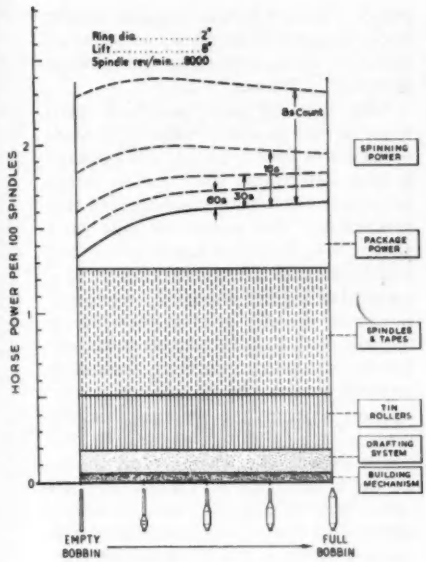
* *British Cotton Industry Research Association*



(left) Fig. 15. The components of ring-frame power consumption



(right) Fig. 16 Effect of spindle speed on component of power required in ring spinning



(left) Fig. 17. Variation of power consumption during build of a bobbin

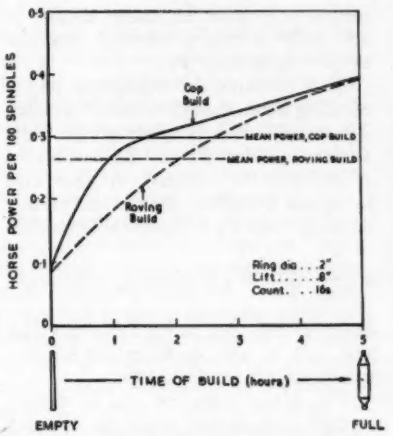


Fig. 18. Variation of package power during build for roving and cop builds

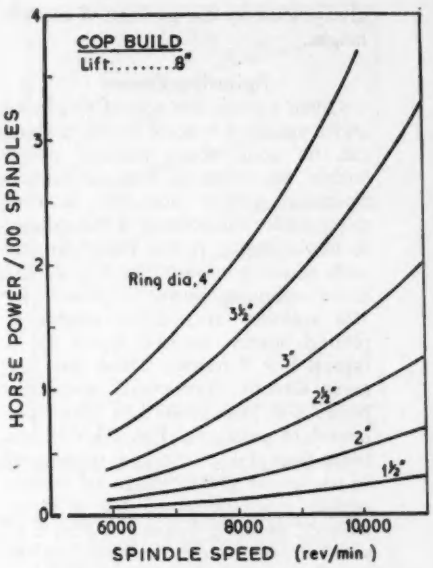


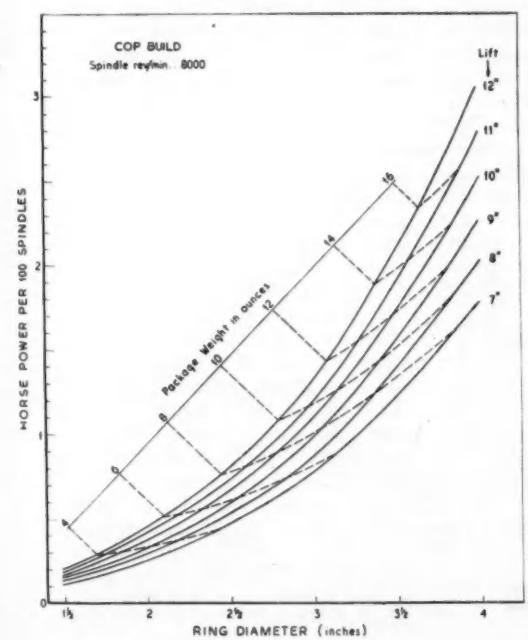
Fig. 19. Effect of ring diameter and spindle speed on package power

but when spinning 8s it is roughly twice as great.

The way power requirements change during the build of a cop is shown in Fig. 17. Package power increases as the package size increases whilst spinning power falls as the balloon height decreases and the mean winding radius increases. It can be seen that when spinning coarse counts the total power rises slowly to a maximum reached after about one quarter of the cycle and thereafter falls very slowly. With fine counts the power requirement increases throughout the cycle reaching a maximum at doffing time.

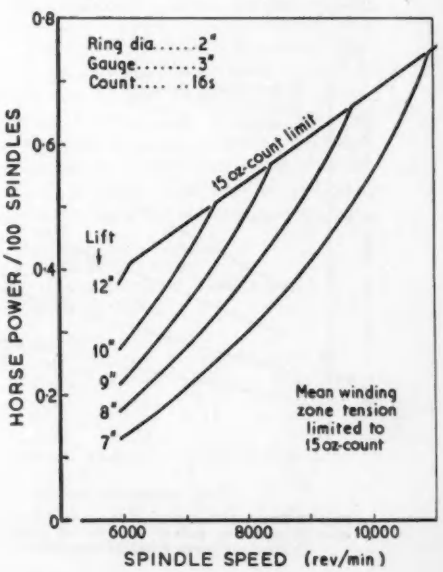
Package Power

Whatever type of build is used it is clear that the maximum package power will be required immediately before doffing, but because the air-drag is roughly proportional to the cube of the package diameter the power requirement increases more rapidly at first for cop-build packages than for roving build. This effect is shown in Fig. 18 which shows that for 8 in. lift 2 in. ring packages the mean package power required for a cop build is about 10% greater than for roving build. The way in which package power increases with diameter and speed is shown in Fig. 19. How package power increases with package size is shown in Fig. 20. In this graph mean package power is plotted as a function of ring diameter for various package heights. Lines of equal package weight have been superposed on the principal curves and it can be seen that for a particular package weight the mean package power is



(left) Fig. 20 Effect of lift, ring diameter and package weight on mean package power

Fig. 21. Relationship between yarn count spindle speed and mean spinning power (free balloon)



always least for the package of greatest height.

Spinning Power

Given a particular size of ringframe and a specified type of build, nothing can be done about package power within the scope of this conference. Spinning power, however, is very much under the control of the spinner in that spinning power varies directly with winding tension. In Fig. 21 the mean spinning power required per 100 spindles at various counts is plotted against spindle speed for a typical 8 × 2 frame. These data are more directly appreciated when the power cost is expressed in pence per pound of yarn. In Fig. 22 this has been done for a winding tension of 15 oz. count and a range of counts against ring diameter. For a given tension, spinning power per pound of yarn is, of course, independent of spindle speed.

Choice of Winding Tension

It is axiomatic that in ring spinning the yarn must be tensioned, but it is interesting to ask "why?" and to examine the function of some of the tensions which exist, or are generated, during spinning. Let us consider free balloon spinning first.

Referring to Fig. 23, the most fundamental requirement is that for a given set of conditions of speed, count and balloon height, the tensions T_O and T_T must be great enough to maintain a stable balloon. It is usually a simple enough matter to generate a sufficiently high tension for this purpose by choosing a sufficiently heavy traveller weight but, as T_N is very closely related to T_O, unduly high values will cause excessive breaks in the only partially twisted material subject to tention T_N.

Now examine the conditions in the winding zone: the relationship between T_T and T_U is dependent on the well-known equation for coil friction round a bollard—the bollard in this case being the traveller—and as the yarn is running from T_T to T_U the relationship is $\frac{T_T}{T_U} = e^{\mu_1 \eta}$ where η is the angle of lap of the yarn around the traveller and μ_1 is the coefficient of friction between yarn and traveller.

The actual value of T_W is closely related and almost equal to T_U but depends on the package radius and on the primary spinning power as the product of yarn tension and package radius at any instant must exactly equal the required driving torque. As the package radius increases the tension required to give a particular torque falls but as the tension T_U decreases T_T also decreases and allows the balloon radius to increase thus increasing the air-drag and the required driving torque. The net effect is such that T_W reduces as the package radius increases but rather less than directly.

Balloon height also affects winding tension because air-drag is reduced as balloon height is reduced. With fixed-spindle-rail machines, variations in balloon height and winding diameter necessarily occur during the build. With cop build the effect on winding tension is a tension cycle largely resulting from diameter changes superposed on a continuous reduction in tension due to reducing balloon height as the build proceeds. With roving build a rather longer balloon height cycle is superposed on a continuously reducing mean tension as the package diameter increases.

The detailed way in which yarn tensions are generated and how such variables as speed, count, and package height determine the tension magnitudes is dealt with elsewhere in this symposium. For our immediate purpose it is sufficient to know how speed and balloon height affect tension in a particular, typical situation. Spinning power is directly related to winding tension and Fig. 24 shows spinning power at the minimum winding tensions which can be used in a free balloon system for various balloon heights and spinning speeds. As one might expect, the tension (and therefor the spinning power) increases with both balloon height and spinning speed, and in some circumstances is a limiting factor in free balloon spinning. A power curve corresponding to a count-tension product of 15 oz. count is included in the figure.

With average yarns it is not possible to spin with a count × tension product greater than 30 and in general 20 should be regarded as the upper limit for satisfactory operation but even with a free balloon this permits a choice of tension between the lower limit fixed by balloon collapse considerations and the upper limit fixed by yarn strength and end-breakage rate considerations. For larger packages and higher speeds, balloon control rings and other devices are necessary and by their use the lower limit is depressed sufficiently to give some freedom of choice of tension.

Given choice, how do we choose our tension? Let us examine the pros and

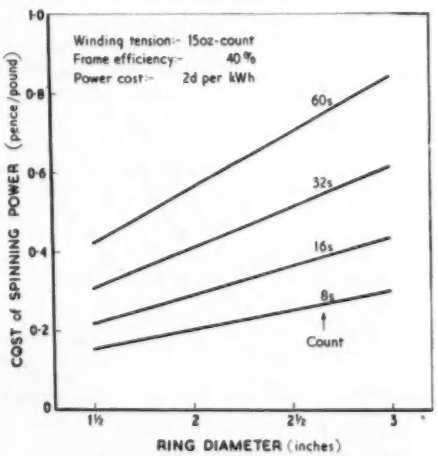


Fig. 22 Effect of count and ring diameter on cost of spinning power per lb. of yarn at constant mean winding tension

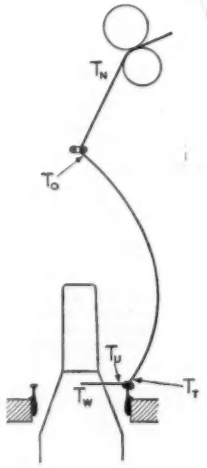


Fig. 23. Tensions in ring spinning

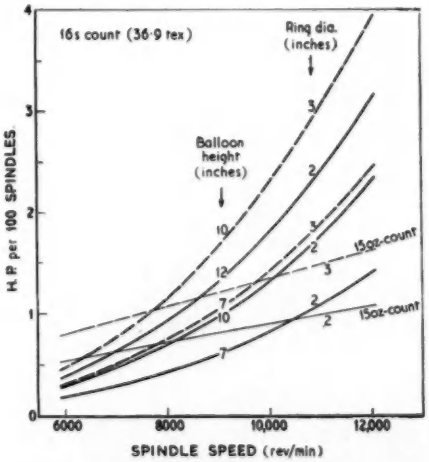


Fig. 24. Effect of spindle speed, ring diameter and lift on spinning power (free balloon)

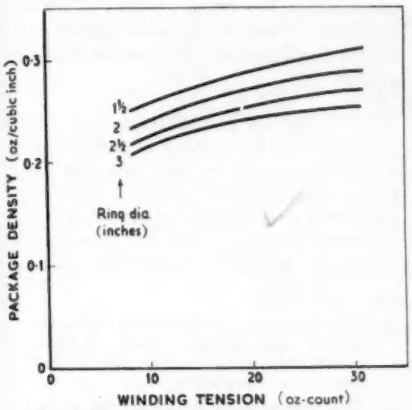


Fig. 25. Effect of winding tension and ring diameter on package density

cons of using the lowest possible tension as fixed by balloon stability considerations. The principal factors are summarised below:—

Minimum Tension	Maximum Tension
Lower power cost/lb. yarn	Firmer package (lower doffing costs)
Reduced end-breakage rate	Less extensible yarn (stronger by lea-strength ttess)
Fuller yarn	

As two of these factors, the lower power cost of minimum tension and the heavier package of maximum tension lend themselves to reasonably accurate evaluation, it is convenient to consider them first.

Economics of Spinning at the Lowest Possible Tension

Probably the most satisfactory way of studying the economic aspect of spinning tension is to compute the savings and additional expenses incurred under various headings if a particular low tension is used instead of a particular high tension. As a tension of 15 oz. count is a common working value the comparison has been made between spinning with tensions of 20 and 10-oz. counts over a range of counts from 8s to 60s.

The most striking effect of the higher winding tension is an attractively firm package which undoubtedly can be regarded as having high "consumer appeal." As a sales gimmick, firmness is an attractive feature but a little inquiry into the relationship between weight and firmness brings one down to earth. Although package firmness increases rather more than directly with winding tension the density increases only slowly. Fig. 25 shows the way in which package density increases with winding tension for three ring diameters. Just how slowly density increases with tension can be appreciated by noting the gradient of the curves at a particular point. As an example, the gradient at 15 oz. count for a 2 in. ring is such that a 10% change in tension results in only a 1½% change in density.

An interesting fact illustrated by this graph is that for a particular winding tension package density decreases with increasing diameter. In a qualitative way this is predictable when one considers that the density of a wound package is dependent on the pressure under which the material is maintained by the "hoop" tension existing in successive layers and that the pressure maintained by a particular hoop tension is inversely proportional to the diameter of the hoop. The effect of diameter on package density is often ignored when considering the economics of package size. Where a comparison is made, assuming constant density, the resulting error will credit a 3 in. dia. package with a weight approximately 20% greater than is realistic relative to a 1½ in. dia. package.

Fig. 26 shows what package weight will be obtained at different mean winding tensions for four common package sizes. As before, the small gain in weight for a substantial increase in tension is the important feature. Note, however, that, though small, the increased density may sometimes be worthwhile when the yarn is such that high tensions can be used—a 7×1¾ in. package wound at 30 oz. count has almost the same weight as an 8×2 in. package wound at 10 oz. count. The economic value of package density is very much dependent on particular circumstances, although the factors involved are common and can best be appreciated by considering a specific example. Assume that a winding tension reduction is proposed and consider the effects of the reduced tension. The most striking effect will be that the package weight is reduced

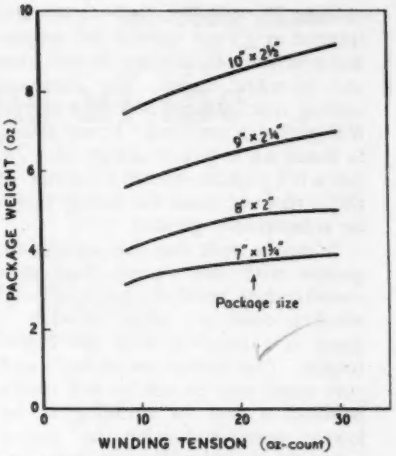


Fig. 26. Effect of size and winding tension on package weight

and the doffing frequency correspondingly increased. This will cost money in three ways:—

(1) Directly by increasing the doffing labour requirement;

(2) Indirectly by increasing non-spinning time—the machine efficiency will be reduced and the cost of spinning labour, depreciation, and overheads per lb. of yarn correspondingly increased;

(3) In a vertical organisation, subsequent yarn processing costs will be increased, or where yarn is sold on the ring tubes the product will be less attractive to the customer.

The only economy resulting from reduced tension which can be simply expressed in pence per pound of yarn is the direct power saving. The actual value of this saving depends largely on local circumstances. It is greatest where power is generated by the mill and least where power is bought from the grid and the cost/maximum demand relationship is most favourable.

The table below (Fig. 27) shows the savings and additional costs incurred with the tension reduced from 20 to 10-oz. counts. The figures refer to three-shift working, spinning 8×2 in. packages at 8,000 r.p.m. with a twist factor of four. The cost of reduced machine efficiency is based on a spinner

Fig. 27. Economics of Spinning at Low Tension
Assumptions: Tension reduced from 20 to 10 oz. count. Package size 8 × 2 in. Spindle speed 8,000 r.p.m. Twist factor 4. Three-shift working.

Cost Changes in d./100 lb. Count ..	8	16	30	60
Reduction in machine efficiency	2·25	2·54	2·83	3·43
Increased doffing frequency ..	4·20	4·20	4·20	4·20
Total additional cost	6·45	6·74	7·03	7·63
Power reduction	6·6	9·3	13·1	18·0
Spinning saving	0·15	2·56	6·07	10·37
Increased winding cost	5·0	5·0	5·0	5·0
Nett saving	—4·85	—2·44	1·07	5·37

tending 750 spindles, depreciation and interest at £1 per spindle per annum and overheads equal to the depreciation and spinners' wages. The increased doffing cost assumes a doffing rate of 600 packages per hour. Power saving is based on a power charge of 1·7d. per kWh and an overall efficiency of 80%; in some cases the saving would be substantially greater.

It can be seen that the savings are greater with fine counts than with coarse counts, but that when additional winding costs are taken account of there is a net loss with the coarse counts. The savings are in any event very small and do not by any means establish a case for spinning at the lowest possible tension on purely economic grounds. They do, however, show that there is no appreciable financial penalty incurred by low-tension spinning.

Other Factors

This means that in choosing the spinning tension there is no economic justification for worrying about the firmness of the package nor about the power cost of winding tension as the effect of these factors on net cost is never more than marginal.

There are other factors, which although less readily assessable, will be more important in most circumstances. Of these probably the most important is the effect of spinning tension on end-breakage rate. A reduction in end-breakage rate with reduction in winding tension is a very reasonable expectation, but in practice substantial anomalies are observed. Reliable data on the relationship between tensions and end-breakage rate are scarce and our understanding of the factors involved is not so precise as to enable us to make quantitative predictions for particular situations.

If other things remained unchanged, a reduction in spinning tension might be expected to produce at least a directly proportional reduction in the rate of end breakage. But other things *are* changed. The number of turns per inch of yarn in the balloon is always greater than that in the yarn being wound on to the bobbin because of the way in which the angle of lap round the traveller opposes the passage of the twist. A reduction in winding tension also permits an increase in balloon diameter which, by reducing the angle of lap of the yarn round the traveller reduces the number of turns per inch of twist in the yarn in the balloon. This reduction of twist in the balloon results in a reduction of twist at the roller nip sufficient in some cases to lead to the apparent anomaly of an increase in end-breakage rate with reduction in spinning tension.

Effect on Yarn Properties

The effect of spinning tension on yarn properties is an involved subject. Not only does the spinning tension affect the state in which the yarn is stored and conditioned, it also affects fibre arrangements and disposition during twist insertion. A low spinning tension combined with a full balloon results in a soft, full yarn. Conversely, a high tension and tight balloon gives a hard yarn.

When the lea-strength is important, it is sometimes possible to achieve high count-strength product figures by spinning at high tensions. The reasons for this are somewhat complex. In the first instance, the higher tension, by straightening and parallelising the fibres during twisting gives a small real increase in yarn strength. The same mechanism also reduces the extensibility of the yarn so that during test the effective rate of loading is increased and a higher lea-strength product obtained. To what extent "yarn strength" achieved by such means is useful is, of course, the concern of the spinner.

Recommendations

Because of the number of conflicting considerations it is not possible to evolve any simple "golden rules" to guide the ring spinner in choosing his spinning tension, but the following rules are offered in descending order of importance.

(1) The highest practicable spindle speed compatible with quality considerations is almost always the economic optimum.

(2) The spinning tension giving minimum end-breakage rate should be used without regard to package density.

(3) Where small differences in yarn quality are very important, it may be worth while to permit a higher end-breakage rate than the minimum.

(4) With coarse yarns and where the end-breakage rate is low there may be a small economic advantage in winding at the highest practicable tension.

Recent Publications

New and Revised British Standards

Ten revised and new British Standards in the aircraft series have just been published, forming part of a series dealing with textiles for aeronautical purposes. The following four standards, now that they have been revised, provide for the line rope or cord to be rot-proofed, if required, and for identification by a code reference:—5F15 — Hemp line and rope for aeronautical purposes; 4F31 — Soft laid hemp cord for aeronautical purposes; 5F32 — Hemp cord for aeronautical purposes; and 2F54 — Flax sewing cord for aeronautical purposes. Additional requirements for yarn twist and strand twist have been introduced into 4F31.

The range of thread sizes in the new editions of 4F34 — Linen sewing thread for aeronautical purposes and in 2F58 — Cotton sewing thread for aeronautical purposes is larger than that specified in the previous editions. Provision has also been made for the thread to be rot-proofed and dye fastness properties are stipulated for dyed thread.

Section One of 4F35 is replaced by F.112 — Twisted and cable flax cords for aeronautical purposes and Section Two by 5F35 — Braided (plaited) flax cord for aeronautical purposes. These new standards provide for the cord to be rot-proofed, stipulate dye fastness properties for dyed cord and provide for identification by a cord reference.

In the revision of 2F59 — Plaited cord for aeronautical purposes, requirements regarding the number of plaits per foot have been amended to improve the structure of the cord. This follows research undertaken for the Ministry of Aviation to investigate the correlation of plaiting with the weight per unit length of the cord. The standard now provides for rot proofing and stipulates dye fastness properties for dyed cord.

Ministry of Aviation specification DTD 767 has been replaced by F.113 — Buoyant cotton cord for aeronautical purposes. The requirements of the new standard follow closely those of the Ministry specification but the use of pentachlorophenyl laurate as the rot-proofing agent is now required and provision is made for the cord to be identified by a code reference.

Copies may be obtained from the British Standards Institution, 2 Park Street, London, W.1. (price 2*s.* 6*d.*).

* * *

Technical Information

The following technical circulars are now available from I.C.I. Ltd., Dyestuffs Division, Blackley, Manchester:—

No. 581. Suitability of Direct Dyestuffs for Dyeing Viscose Rayon Cakes.

No. 584. 1961 Fashion Colours—Nylon Hose

No. 585. Dyeing "Terylene"/Cellulosic Unions: Batch Dyeing Methods.

No. 586. Procion Dyestuffs: Application to Cotton and Linen by Batchwise Dyeing Techniques: Simplification of Dyeing Recipes.

No. 588. Procion Dyestuffs: Continuous Dyeing of Viscose Rayon Yarns and Loose Staple Fibre.

No. 589. Dyeing "Terylene"/Wool Blended Materials: Supplement No. 3.

No. 591. "Terylene" Polyester Fibre: Dyeing Recipes for Selected Shades from B.C.C. Dictionary of Colour Standards.

Raw Material Problems in the Jute Industry

In considering alternative sources of materials the main factors are (a) price, (b) adaptability for commercial production, (c) suitability for process on standard equipment and (d) satisfactory end product

By S. A. G. CALDWELL, F.T.I.

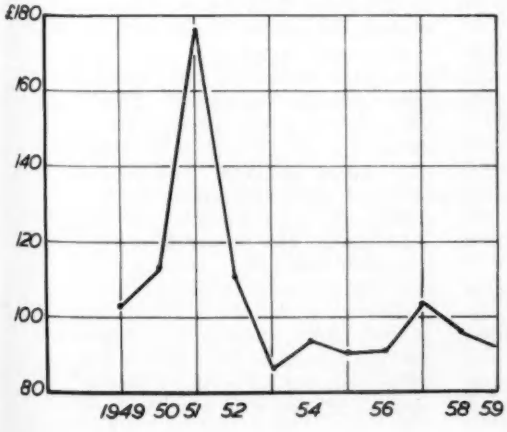
RAW material represents the major item in cost of end products in the jute industry. Consequently raw jute values determine demand in the market for manufactured goods, and particularly for packaging materials, which constitute the bulk of the turnover and have, in recent years, been subject to competition from substitutes which enjoy relatively staple raw material prices. Statistics published in the Commonwealth Economic Committee's "Annual Review of Industrial Fibres" indicate that over half the world's annual supply of raw jute is produced in Pakistan, which State also supplies over 95% of the world's raw jute exports. The manufacturing centres of Europe are consequently almost entirely dependent on this source for their raw material requirements, and are vulnerable to the exploitation such a position makes possible.

Despite the fact that raw jute exports constitute the main source of revenue the Pakistani authorities have largely failed in their responsibility to meet market requirements, which demand price stability and an assured supply. At times they have exploited the market for immediate gain. While some effort has been made recently to eliminate excesses the position is still far from satisfactory, as evidenced by a study of the graphs in Figs. 1 and 2. Fig. 1 indicates the average price per ton of First Marks from 1949 to 1959 inclusive. The graphs in Fig. 2 show the monthly averages for the years 1956 to 1959. It will be seen from these that the price has fluctuated considerably over any one year, the fluctuations ranging from 10 to 25%, and conforming to no specific pattern.

In its main sphere as packaging material the chief merit of jute has been the low raw material cost. This item represents the major part of the end product price, and while packaging material plays an important role in industry, it is an ancilliary one with price as the determining factor of demand. Efforts to develop jute fibre production on a commercial scale in many countries have failed because of the temperamental nature of the plant. Outside Pakistan and India, the main producers, the chief sources of supply are Brazil, Burma, Japan and Formosa all which produce fibre of good spinning quality, but have an insignificant surplus available for export.

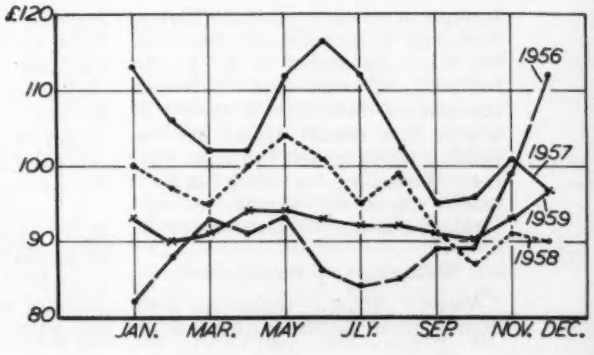
The principal requirements of any alternative source of material include cheapness, adaptability for production on a commercial scale, suitability for processing on standard jute manufacturing equipment, and ability of the end product to give comparable service to the user. Demand will be measured by the extent to which it complies with these. Failure by the jute manufacturing industry in post-war years to show a comparable expansion to that of the main market for its products, together with the increasing use of paper and other substitutes, is due almost entirely to price. This has been aggravated by needless fluctuations initiated by manipulators for their own immediate gain, without thought of possible long term effects on the industry as a whole.

With price as the determining factor of demand it may be asked at what price does jute become uneconomic and users of jute divert their attention to substitutes. In its main



(left) Fig. 1. Average price per ton First Marks (1949-59)

(right) Fig. 2. Monthly averages (1956-59)



role as packaging material demand is closely related to general industrial and agricultural activity, market values being defined by this and by current prices quoted by competitors. Present conditions suggests that a peak, not exceeding £100 for Firsts, with *pro rata* rates for other grades, would ensure a substantial demand for jute and its end products. Improvements effected in seed strains to produce crops with high fibre content, together with better methods of cultivation and processing, have failed to offset higher labour and handling charges which, with other incidentals, have helped to advance market rates to their present uneconomic level.

Expansion into new markets for specialised products has increased demand for the higher grades of raw material, which continue in short supply. Consumer market trends indicate further expansion in demand for these. The price gap between jute and man-made fibres has narrowed to a point at which the latter have become competitive in markets for certain jute speciality products.

In the absence of adequate supplies of high grade jute an alternative lies in upgrading available material to meet end product requirements. This may be effected on the raw material or in early stages of manufacture to extend yarn count, weight range and quality of cloth. Also by treatment of the latter to extend end use. Physical and chemical characteristics of the jute fibre define the limits of such treatments, nevertheless recent research has extended considerably the possibilities in this direction.

Upgrading can be effected by replacing old type equipment in the spinning section by modern machinery and improved processing techniques. The Dundee industry has exploited this means effectively. Recent surveys indicate that less than 5% of existing spinning equipment is now old type. The manufacturing industry in India has also made considerable progress with re-equipment. Jute manufacturing centres in Continental Europe have been slower to change, but these too are being forced to accept the inevitable or close down. Even so research and development proceed at a pace that quickly makes existing practice obsolete, and the most successful business is that which can most readily assess and exploit the advantages of new methods and materials.

Softening and Purification

Various chemical treatments have been evolved for the purification of jute fibre to extend its spinning range and to alter the yarn and cloth characteristics. A process for the softening and purification of vegetable fibres, with particular reference to jute, is described in B.P. 542,247. This is intended to remove the pectin and lignin without damage to the fibre or undue reduction of strand length. The treatment makes the fibre more sensitive to bleaching and dyeing, while also reducing risk of subsequent damage by bacterial action.

The fibre is soaked in water in an open tank for 60 min., the temperature being raised to 90°F. and the liquid kept in circulation during the process. This is subsequently drained-off and the material treated for 15 min. in a bath of 1% carbonate of soda, and about 0·5% of a detergent at 110°F., the liquid being kept in circulation. A simultaneous lifting and lowering apparatus is desirable to ensure uniformity of treatment. This is followed by washing in water and subsequent immersion in a bath containing 2% "ammonal," a batching preparation, and 0·5% carbon tetrachloride in water at 90°F. for 30 min. On removal the material is hydroextracted and dried.

It has been observed that successive treatments with a hypochlorite under alkaline conditions, and with peroxide are effective in increasing the percentage cellulose content without undue removal of essential substances, so that the appearance and spinning capacity of the fibre are improved. In a process set out in B.P. 533,020 for the purification of jute and other fibres the hypochlorite treatment is conducted with a solution of low content available chlorine, not exceeding 3 grams per litre. It lasts only about 15 min. so that no perceptible bleaching effect results. The material is rinsed and is subjected to a peroxide bleach, following which it is again rinsed and dried, being then ready for processing.

Mercerising and woollenising can be effected by treatment in cold concentrated solutions of caustic soda. Fibre which has been stapled prior to treatment subsequently assumes a curled wool-like appearance, and can be mixed with wool in the manufacture of low grade fabrics, or can be processed alone to produce yarns and end products with a full handle.

A treatment for jute roots to extend their range of manufacture is described in B.P. 522,620. This includes a bath in sodium hydroxide and common salt, followed by washing, and subsequent treatment in water containing a small quantity of sulphuric acid. The material is then passed through rollers to remove the liquid, being subsequently washed and dried. The treatment results in a weight loss of 7 to 10%. The cost of treatment is low and the treated fibre has similar qualities to wool.

Developments such as these have opened up new fields for jute end products, giving them entry to markets formerly reserved to cotton, linen and wool. They provide also a means for upgrading the lower marks to extend their range of manufacture. They do not, however, provide a solution to the problem of stabilising raw material values or of providing alternative sources of supply when jute prices become uneconomic. This lies in the development of suitable substitute fibres, which can be produced cheaply, and are adaptable to a wider field of cultivation. Considerable progress has been made in this direction in recent years, with sufficient experience now gained to extend bulk production.

A certain amount of confusion has resulted from ambiguity in nomenclature of the chief substitute fibres, due in part to the various sources of supply, and to the fact that in some instances the same name is used to describe fibres from different plant species. Referring to this confusion, and to the practice of defining certain of these fibres as "hemps" Sir George Watt suggests in his "Dictionary of Economic Products of India" that the name hemp should be confined to fibre similar to that obtained from the true hemp plant *Cannabis Sativa*, and that fibre from *Hibiscus* should be classed with jute.

The adaptability of jute processing equipment covers the processing needs of most bast fibres, which include the main substitutes for jute. These can be processed alone, or in blends with the latter, with relatively minor modifications in ordinary processing practice determined by the jute used.

The most extensively used substitute for jute is the fibre obtained from *Hibiscus cannabinus*. This is designated commercially by various names including mesta, bimlipitam jute, kenaf, stokroos and Deccan hemp. It is produced commercially in India, and with suitable treatment good quality fibre is obtained. It is somewhat coarser and stronger than jute, but can be processed readily on standard jute equipment. Production of mesta fibre is prohibited in Pakistan, but has increased in India where, "The Industrial Fibres Review" records, 282,000 tons were produced

in the season 1958-59. It has a wide range of cultivation in tropical countries in both Eastern and Western hemispheres. Production in these could be expanded and the crop improved by selection and cultivation to raise fibre quality to the level of the higher grades of jute. The most suitable type of seed bed is a well drained soil. *Hibiscus cannabinus* is unsuitable for cultivation in heavy water-logged ground. Planting should be in rows approximately 9 ins. apart, with 2 to 3 ins. between plants. A. E. Harrer, in "Jute Substitute Fibres," records that the species is most suitable for cultivation in regions between the latitudes 30° north and south of the Equator, being responsive to photo-periodism.

Chemical analysis and microscopical examination indicate a very close resemblance to jute. Though the mesta fibre is generally considered coarser and less flexible it is considerably stronger. The quality of present supply compares favourably with medium grades of jute, for which it can be substituted, or used in blends to manufacture the range of end products for which such grades of jute are normally used, imparting to these the added strength and durability inherent in the mesta fibre. Harrar records that tests carried out in America to compare the serviceability of jute and mesta bags used in bulk consignments of sugar showed that plantation mesta fibre products surpassed those made from jute.

Fibre quality is closely related to time of harvesting, the highest grades being obtained from plants harvested immediately after flowering, by which time the fibre system has attained full development. It is usually delayed, however, until the seed capsules have developed. This permits the seed to mature on the stems when these have been stooked to dry out. The seed is removed by threshing prior to decortication.

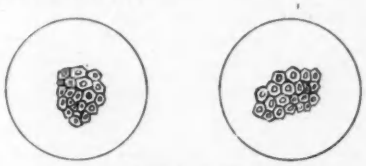
The usual method of fibre extraction is by retting in water and stripping as with jute. In the newer centres of production in Africa and Cuba considerable progress has been made in crop handling and fibre extraction by mechanical means. Cutting and binding equipment has been evolved for harvesting, and mechanical decorticators are now available to extract the fibre. This can be effected prior, or subsequent to retting. In the first instance the decorticated strands must be retted or chemically treated subsequently to effect more complete separation and the removal of adhering tissue. Decorticated material rets in shorter time, due to the more ready access given to the retting organisms. Fibre yields vary with conditions of cultivation and growth. In favourable circumstances these range from 2,000 to 4,000 lbs./acre.

Similar Characteristics

Fibre structure and characteristics are allied to jute. Strand dimensions range from 4 to 10 ft. in length, fineness being related to condition of growth and method of extraction. The ultimate dimensions are also approximately similar to those of jute, as evidenced by the comparison in Table 1. The ultimates of both fibres are very similar in cross-section, as indicated in Figs. 3 and 4. Both are polygonal in outline, the lumen in each being rounded or oval, and occupying a considerable part of the total area, the ratio increasing as the fibres taper off at the ends.

Table 1.

	Jute	Mesta
Length	1 - 6 mm.	1 - 5 mm.
Diameter	15 - 25 microns	12 - 20 microns
App. Density (Sarker, "T. Mfr."), July, 1952	1·297 gm./c.c.	1·274 gm./c.c.
Torsinal Rigidity, July, 1952	18·60	18·58
Percentage Cellulose (Goossens)	76·79	75·76



Figs. 3 and 4. Comparisons in fibre characteristics

The plant *Hibiscus Sabdariffa*, commonly termed "roselle," is also a valuable source of fibre which is used as a substitute for jute. It has a wide distribution in tropical countries, and in those bordering the tropical zone. For maximum crop yields it requires a combination of high moisture with heat during growth. There are two varieties in cultivation, *H. Sabdariffa L*, the older branched variety, has long been grown principally for its food value, the succulent edible calyces being used to make preserves. It is also a useful source of fibre, though this is generally inferior in quality to the product of *H. Sabdariffa altissima*, which is taller and relatively free from branching.

The fibre quality is closely related to conditions of growth, harvesting and extraction. As with other bast fibres the time of harvesting is a critical factor. Cutting in the flower bud stage, when these are developed but prior to opening, ensures maximum quality at a slight sacrifice of strength but as the latter factor is normally superior to jute this is of little consequence, and with normal care in extraction the fibre could be equal to the higher grades of jute. Ordinary conditions of production seldom ensure maximum fibre quality so that the commercial product is generally slightly inferior to jute fibre in quality. It is very similar in mechanical properties, requiring approximately similar treatment in manufacture.

The recognised fibre value of *Urena Lobata* and its wide distribution, natural or naturalised, in most tropical and semi-tropical countries of the east and west hemispheres has ensured its competitive position with jute where availability combines with exchange to give it preference. Commercial production, which was stimulated by raw material shortage in the immediate post-war years, has tended to decline with the increasing availability of jute, but it is certain that this could be quickly expanded to meet any emergency. *Urena Lobata* is a shrub-like plant which, under suitable conditions of cultivation may attain a height of 8-10 ft. Warm humid conditions and rich soil are desirable for good crop production and high fibre yields. Cultivation for fibre has been carried on extensively in the Congo, and to a less extent in Brazil. *Urena Lobata* is more closely allied to jute and is comparable as a substitute to *Hibiscus cannabinus* or *H. Sabdariffa*. The fibre strands and ultimate dimensions are similar to those of jute, as is also the cross-section structure which is shown in Fig. 5.

Fig. 5. Dimensions similar to jute

The main obstacle to commercial development of these substitute fibres in countries, other than India or China, which are suitable for their production is shortage of labour for handling the crop. Machines and other equipment for harvesting, tank retting and

mechanical decortication, have now been developed and are being used successfully commercially. Combined harvesting-decorticating units have also been evolved to extract unretted fibre. Harvesting is usually effected by a modified hemp harvester and binder, the stems being tied in bundles for transit to decorticating centres. Alternatively it is operated in conjunction with a decorticating unit to extract the fibre, which is later subjected to a biological ret or a chemical treatment to eliminate cortical tissue and effect more complete separation of the strands.

Constructional details vary, but usually include in sequence fluted breaking rollers to fragmentate the brittle woody core; revolving scrapers to remove this and as much as possible of the adhering cortical tissue; brushing or combing mechanism to effect further cleaning and refining of the fibre strands. The Gundry decorticator, details of which are shown in Fig. 6, comprises essentially a feed table A on which the stems are laid top end forward. These are drawn through the fluted breaking rollers B B^1, passing subsequently between the vanes of the cleaning drums C C^1. These travel at a substantially higher surface speed than the breaking rollers —which determine the rate of travel through the machine—and consequently beat or scrape away the fragments of wood and bark tissue. On delivery from the cleaning drums the fibre strands pass between a pair of endless belts fitted with scraper blades which effect further cleaning action, also parallelising, opening and softening the fibre to improve its spinning quality. Output varies with the length and quality of the straw, being in the region of 30 to 35 lbs. of cleaned fibre per hour.

On the Faure machine, shown in Fig. 7, constructed by A. Faure and Cie., Limoges, France, the feed table is shown at A, the broken stems being acted on by the beater C as they pass from the fluted feed roller B. The material is delivered on to a conveyor D which carries it to a pair of fluted retaining rollers E. These hold it against the action of the scutching rollers F. The cleaned fibre passes subsequently to the delivery sheet G. This machine is constructed in two sizes, the "Canope" model capable of processing up to 800 kg. of stems per hour, with fibre output up to 28 kg. per hour, and the "Capella" unit with crop capacity up to 1,200 kg. and fibre output up to 52 kg. per hour.

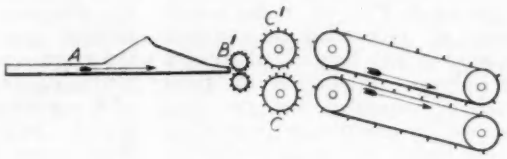


Fig. 6. Main parts of the Gundry decorticator

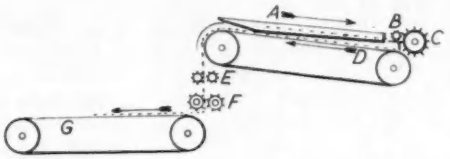


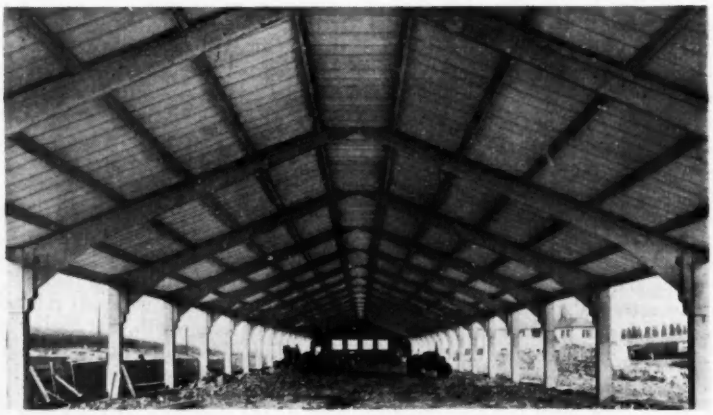
Fig. 7. Constructional features in the Faure machine

The Alfa Gar decorticating and refining unit consists of two machines. It is designed primarily for processing unretted crop. The first machine includes breaking and decorticating mechanism, with water jets to wash the fibre, removing gummy binding substances. The refining machine includes a series of fluted retaining rollers, succeeded by beating and scutching members, with a brushing device at the delivery side. A variable speed is provided. Various other makes of machine are also available so that the problem of mechanical decortication no longer exists.

Silk Throwsters New Factory

A new factory for processing silk and synthetic fibre yarns has been constructed for Glemsford Silk Mills Ltd., the Suffolk silk throwsters. Modern production techniques called for an unrestricted floor area and the size of the new building, which is 255 ft. long with a span of 50 ft., will considerably assist materials handling and make for a more economical flow in processing.

A precast reinforced concrete structure by E. W. Tyler & Co. Ltd., Cannon Lane, Tonbridge, who took only four days to erect the framework, the new factory has been erected on an adjoining site to the present premises. Divided into seventeen 15 ft. bays and 12 ft. high to the eaves, it has a roof of universal sandwich construction with a blanket infill of industrial Bondalay-bonded "Fibroceta" wadding faced one side with aluminium foil. This offers a thermal insulation value of 0·18, which is said to be well within the requirements of the thermal insulation Act.



LOOM PIRN TRAYS. British Standards Institution, 2 Park Street, London, W.1. (price 4s. 6d.).

A new British Standard (B.S. 3331:1961) should reduce the unnecessary variety of pirn trays used on automatic and non-automatic looms. This will enable manufacturers to produce stock items in quantity and should relieve users of the need to carry a wide range of replacements. Two types of tray are laid down: one with symmetrical rows of pegs for pirns containing man-made fibre yarns and one staggered rows of pegs for pirns containing staple fibre yarns. The trays will accommodate full pirns of 1, 1¼ and 1½ in. dia.

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

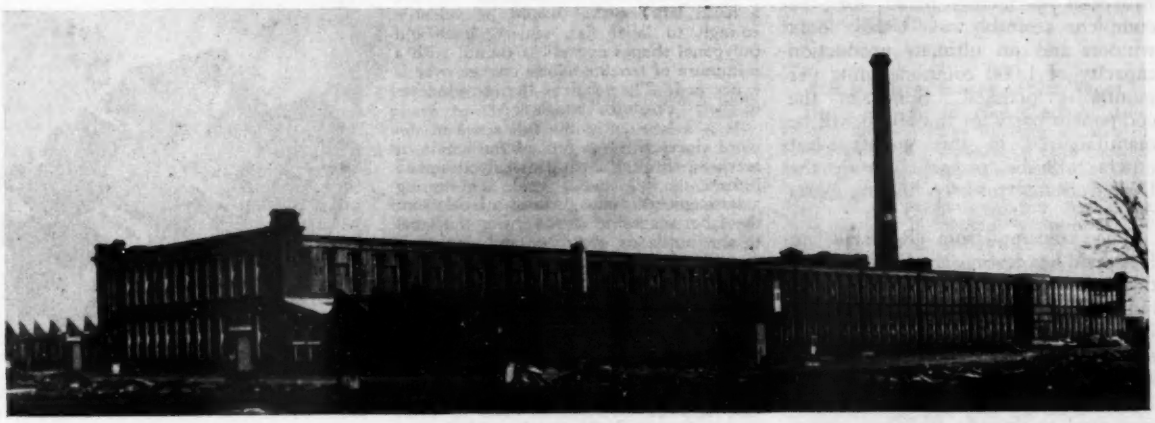
Progress and Planning of Winding and Warping Machinery Programme

Brief details of the production programmes designed for the new premises and capacity of Leesona Holt Ltd.

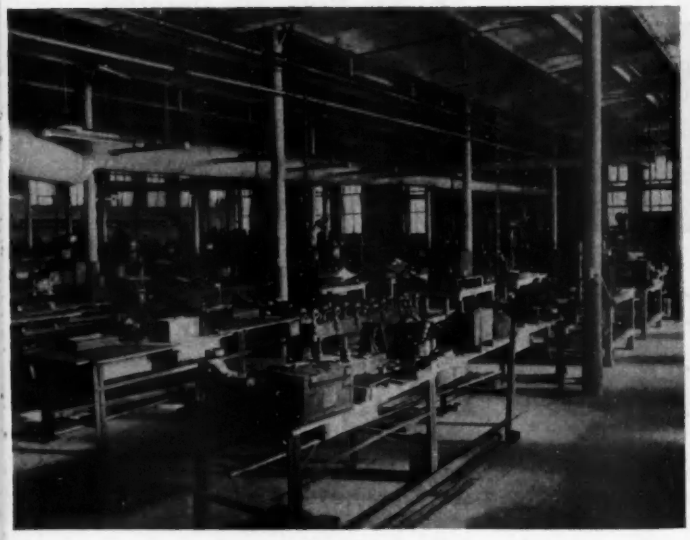
LEESONA HOLT LTD., the well-known textile machinery manufacturers, have completed the transfer of their principal manufacturing unit from Rochdale to the newly converted Unity Works at Heywood, Lancs. This is the latest stage in the company's plans for expansion which are expected to treble the present production capacity within the next three or four years. Unity Works at Broadfield, Heywood, built in 1908, was a cotton spinning mill and continued in that capacity until the end of 1959. At that time, Thomas Holt Ltd., Rochdale, amalgamated with the Leesona Corporation of Providence, R.I., U.S.A., to form Leesona Holt Ltd., and this new company took over the building.

The transfer of production from Rochdale began in July, 1960, and was virtually completed by February

View in the main machine shop



Unity Works, Broadfield, Heywood



The toolroom and reconditioning department

View looking down the fitting shop

22nd, 1961, when a reception was given at Unity Works for the Press and local civic leaders. The guests were welcomed by Mr. Robert Leeson, (president, Leesona Corporation, U.S.A.) and Mr. E. Brierley and Mr. J. A. Nasmith (joint managing directors, Leesona Holt Ltd.). Guests, who toured the premises, included the Mayor of Heywood, Counc. S. M. Healey; the Town Clerk Mr. W. R. Parker; Borough Surveyor Mr. A. Middleton, and Counc. H. Hinde, (chairman, Industrial Development Committee.)

The full range of Holt winding machines will be manufactured at Unity Works and the company hopes to take over the manufacture of many American models at present being produced in the United States by the Leesona Corporation. Between 40% and 60% of output will be for export. Provision is being made for the complete assembly of Unifil loom winders and an ultimate production capacity of 1,000 complete units per month is planned. Some of the component parts for the Unifil will be manufactured in this country but others will be imported from the United States to keep tooling costs down.

The transfer from Rochdale to Heywood has cost nearly £350,000 and this covers extensive alterations to the building and the provision of plant. Unity Works consists of a two-storey section approximately 500 ft. × 100 ft. joined to a single-storey section 400 ft. ×100 ft. An engine house has been converted to provide additional space and the total floor area available is approximately 200,000 sq. ft.

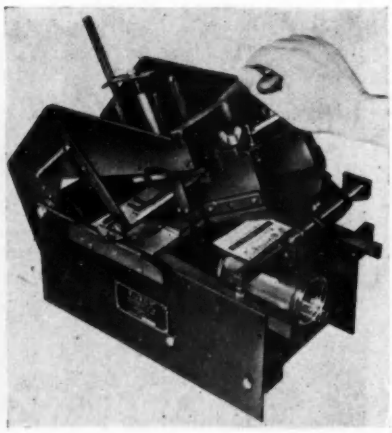
A new access road has been built on the west side of the works to facilitate the flow of incoming raw materials, finished machinery being despatched from the other side of the works. Production flows forward continuously through machine shops, inspection, stores control and assembly bays. Unity Works will give employment to more than 500 workers and although labour will be drawn from a wide area, employees from the former Rochdale works are being encouraged to travel to Heywood. Leesona Holt Ltd., have also extended their works at Darwen to bring about a 50% increase in the production of sizing and warping machinery.

Hand Labelling Machine

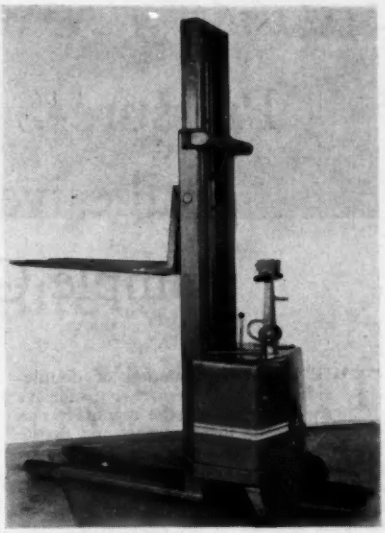
IN this world of automatic production there are still many jobs that do not lend themselves to mass production methods. Labelling is one of them. Short, interrupted and sampling runs, even experimental work before it reaches the automatic stage and Purdy Machinery Co. Ltd. with their very long experience of semi- and fully-automatic labelling, have become increasingly aware of the need for a hand labeller that would be versatile enough to label flat, square, oval and polygonal shapes as well as round, with a minimum of trouble where change over is concerned. The result is the introduction of their "Prestofix" machine.

It is a labeller in the full sense of the word since with one pull of the handle it actuates, through an ingeniously designed linkage, the full labelling cycle of gumming a static picker plate, picking a label from the label magazine, transferring the label to the bottle or container and wiping it securely in position. It is completely portable and easy to move.

It is easy to clean, all parts being readily accessible and the gum box, situated beneath the picker plate, can be quickly removed for servicing. All labelling parts have been designed for speedy adjustment and quick change over. The "Prestofix" will label bottles or containers of from 2½ in. dia. up to 3¼ in. dia., label sizes being from 1½ in. up to 3½ in. deep by from 2 in. up to 4½ in. wide. The maximum label width formula for round bottles is, half of circumference less ⅛ in. and the maximum label height is 6 in. from the bottom of the bottle to the top of the label.



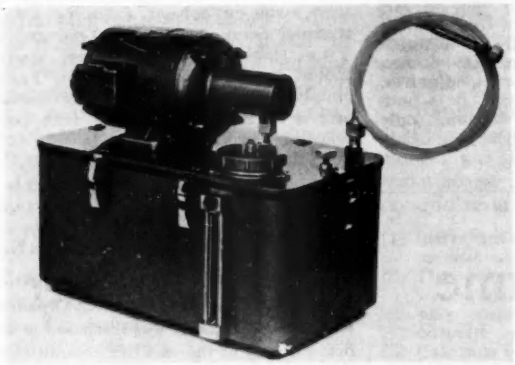
Mechanical Features in New Powered Stacker



A VERY compact battery operated pedestrian controlled stacker of Swedish design and manufacture has just been introduced into this country by the sole distributors, Rolatruc Ltd., 207 Hanworth Road, Hounslow, Middlesex. Known as the BT powered stacker, it has a lifting capacity of 2,200 lb. at 24 in. load centre with heights of lift ranging from 92 to 132 in. It is powered by two 6-volt traction batteries with a 350 A.H.C. connected in series which operate a motor built into the drive wheel and provides a maximum speed of 2½ m.p.h. laden and 3 m.p.h. unladen. A separate motor coupled direct to a gear type pump operates the hydraulic lifting mechanism which is fitted with a safety valve as a protection against overloading. The mast channels are one piece pressings combining high strength and resistance to wear with low weight.

The driving controls are at the head of the steering handle and provide two speeds forward and two reverse with a light fingertip action which is completely foolproof in operation. The hydraulic lift is operated by a push button. A horn button and an ignition type switch complete the control assembly. The steering handle can be moved 100° in either direction and the manoeuvrability of the truck is such that the aisle width needed to stack 48 in. wide pallets is only 79 in. A shoe type brake working on the drive wheel is actuated by bringing the steering handle to the horizontal or to the vertical position and when left in the latter position it acts as a parking brake. The drive wheel is fitted with a 1 in. thick replaceable solid synthetic rubber tyre the two swivel wheels being made of nylon reinforced bakelite. The rollers are of the same material and are in tandem to facilitate movement over uneven surfaces. All wheels are fitted with double fully enclosed SKF bearings.

A spring loaded platform is fitted on which the operator can ride, a feature which helps to reduce driver fatigue when working over long distances. The overall length of the truck with the standard 45 in. forks and the platform in the raised position is 75 in. Width is 31½ in. The overall height of the model with 124 in. height of lift is 83 in. If required a free lift equivalent to half the total lift height can be provided for stacking in places where headroom is unusually restricted.



New Pump and Spray Unit

A NEW pump and airless sprayer known as the Burgess-Duron motorized pump unit, is announced by Burgess Products Co. Ltd., Small Tools Division, Sapcote, Leics. The unit has been developed primarily as an applicator of Duron Anti-static emulsion to fibre slivers prior to spinning and has proved itself capable of meeting the critical requirements of emulsion application. The emulsion is applied in the form of a carefully controlled and finely divided spray of uniform density across the spray cone to ensure even impregnation over the yarn slivers.

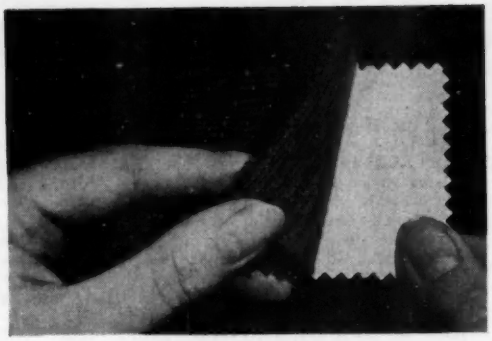
The unit is self-contained, comprising a 2 gal. tank onto the lid of which is mounted a Brooks ½ h.p. 400/440 volts 3-phase motor, (the unit can alternatively be supplied with a 200/250 volts single-phase motor), pump assembly, control valve, filler cap introducing a plastic foam filter, and a 6 ft. nylon delivery tube at the end of which is a detachable spray nozzle. All components in contact with the emulsion are of non-corrosive materials. The pump is of the reciprocatory type driven by an eccentric on the motor shaft. Rate of delivery to the spray nozzle is controlled by a manually-operated non-return ball valve connected down stream from the pump. Another non-return valve fitted in the delivery tube prevents escape of fluid during periods of non-use, maintaining the unit in a fully primed condition.

Using the standard 0·016 in. dia. nozzle (giving a 60° included angle spray) a flow range from 15 cc. to 150 cc./min. can be obtained with water thin liquids. The unit can be used as a pump by removing the spray nozzle and fluids of various viscosities can be delivered at pressures up to 150 p.s.i. at rates depending upon their viscosities, providing means for the controlled injection of a fluid into a pressure pipe-line or vessel.

U.S.A. Heavy Buyer of N.Z. Wool

Heavy buying of New Zealand wool by the United States in three months of 1960 is shown in statistics of wool entered for export. In September last, the U.S. bought 28,754 bales compared with 51,551 in the previous two months. Total N.Z. exports in September were 98,338 bales compared with 81,865 bales in September 1959, and with 111,721 bales in August, 1960. Shipments for the three months ended September totalled 333,917 bales, an increase of 44,400 bales, 15·3% more than the comparable 1959 figures. The 80,305 bales shipped to the U.S.A. in the first three months of the current season represent 24% of the total compared with 20·8% in the same period of 1959-60.

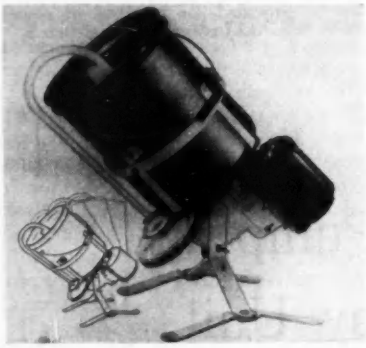
Pressure-Sensitive Adhesives for Sample Cards



THE recent introduction of double-sided pressure-sensitive adhesive sheet is enabling the manufacturers of sample cards in the carpet and textile industries to overcome the disadvantages inherent in the use of some glues and adhesives. Fraying of the sample edges, slowness in applying the glue to individual samples, seepage of the adhesive through the sample are said to be overcome by the use of the new double-sided adhesive sheet and tape.

S. E. Crease and Co., Church Street, Chiswick, is one firm which have been using the pressure-sensitive sheet for sample card contracts in recent weeks. Using Sterling Coated Materials "Stik-a-ply", the company have rolled the pressure-sensitive straight over the back of the rolls from which the samples are to be cut. This still leaves an adhesive surface on the underside that is covered with quick-release backing. The samples are then cut out, the backing paper peeled off, and the textile or carpet pieces stuck on the cards. Adhesion is firm and claimed to be permanent.

Versatile Portable Mixer



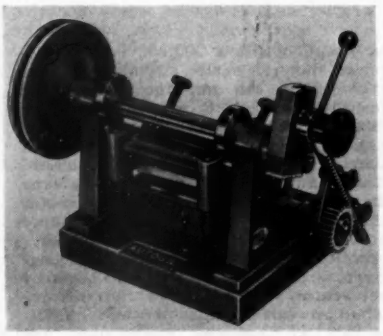
JUST right for one-man operation is the claim of General Trade Equipment Ltd., 82 - 90 Seymour Place, W.1, for their new American portable industrial mixer, which is said to mix 8 cu. ft. of concrete per hour continuously. Designed to mix practically all materials i.e. cement, concrete, mortar, plaster, paints, powders, resins, plastics, adhesives, printing inks, chemicals, etc., it is both versatile and portable, weighing only 37 lb. complete and occupying only 2 ft. square. Pointing out that it mixes an average load of 50 lb. (max. 70 lb.) or 4½ gallons, the makers say it is easy to clean in that it only requires flushing out with water or solvent according to the material being dealt with. Operated by ½ h.p. single phase heavy duty electric motor, it can be plugged into any 5 amp. supply providing it is suitably earthed and it is supplied complete with paint and slurry paddle.

High Speed 4 in. Guillotine

THE "Autogil" Model 4 HS high speed guillotine made by Wallis Engineering Co., 399 Warwick Road, Birmingham 11, has been developed from the firm's existing range of guillotines. It has been specifically designed for the rapid production of any length pieces of material, up to a maximum of 4 in., from coil or strip stock not exceeding 4 in. in width or ¼ in. thickness (·015 for metals).

The high degree of accuracy with which the pieces are measured before being cut is consistently maintained in spite of its high output. When feeding from one coil of material it is possible to produce 300 cut pieces per minute or if the machine is fed from two coils of material simultaneously, 600 pieces per min. can be cleanly and precisely produced.

Suitable motors, pulleys, etc. for driving the above machine at the recommended speed can be supplied from stock. Weight, boxed: 67 lb.; measurements, overall are 11½ in. high; 20½ in. wide; 11 in. deep.



Laboratories for Wool Research in N.Z.

Erection of a "substantial laboratory building" for the Wool Research Organisation of New Zealand was discussed at the first meeting of the excutive committee in Wellington. The meeting also decided to advertise for a director, who will take office in about April, 1962, and help in planning the buildings and recruiting staff. Fellowships will be awarded annually to enable future members of the staff to obtain specialised training in overseas institutions. Completion of the building and installation of equipment is not expected before 1965. C. H. Bethell, member of the Wool Board and a North Canterbury sheep farmer, was elected chairman of the committee. The Wool Research Organisation is an independent body to which the Government and the Wool Board will jointly contribute £100,000 a year.

THE TEXTILE
COLOURIST & FINISHER

Notes on Chlorine in Bleaching

Points dealt with include the manufacture of hypochlorite, sodium hypochlorite bleach liquor, the influence of chlorine on bleach liquors, importance of protein chloramines, continuous hypochlorite bleaching, bleaching linen with hypochlorites, hypochlorite v. *hydrogen peroxide, and hypochlorite in clearing treatments*

By "TECHNICAL CORRESPONDENT"

THE discovery of chlorine by Scheele in 1774 ushered in a new era in cotton and linen bleaching although it is probable that the discoverer was not aware of the far-reaching consequences of his work. It is related that "until the middle of the eighteenth century Holland was the bleach-field of Europe." English cloth sent in March was returned bleached in October. Processing followed the sequence (*a*) steeping for a short period in soda lye, (*b*) treatment for a week with potash lye poured over and through the cloth at the boil, (*c*) washed with water, (*d*) soaked in buttermilk under pressure for 5 - 6 days and (*e*) spreading on grass for several months, kept wet and exposed to the sun.

The process was shortened by half when the virtues of sulphuric acid as a substitute for buttermilk were discovered. Following this came the use of gaseous chlorine after its discovery by Scheele and the realisation that it had oxidising properties which could be used in bleaching. A major event in the history of bleaching took place when Chas. Tennant of Glasgow took out his first patent in 1798 for the production of bleach liquors by the absorption of chlorine in milk of lime. This was quickly followed by the preparation of bleaching powder from slaked lime and chlorine, a process which was in continuous production thereafter for a century in the same works. Present day methods make use of sodium hypochlorite prepared from electrolytically produced chlorine absorbed in caustic soda solutions; where large quantities of hypochlorite are required they are prepared on the site by well-established techniques.

Manufacture of Hypochlorite

Where large quantities of hypochlorite are used it is advantageous to manufacture on site[3] and this can be done in several ways:—

(1) Introduction of chlorine gas into caustic soda solution.
(2) The same technique applied to waste mercering liquors where only small quantities of hypochlorite are required.
(3) Calcium hypochlorite solution can also be made by the introduction of liquid chlorine into suspensions of lime CaO.
(4) Electrolysis of common salt, NaCl.

The latter process has been known since 1883 when it was used seriously for the first time, it is said, at Glasgow University. A demonstration was given using linen cloth which was drawn through a solution of sodium chloride, while passing an electric current through the wet cloth. This resulted in the production of sodium hypochlorite on the fabric. Such experiments led to the development of the electrolytic cell method whereby electrolysis of common salt solution was brought about by the passage of direct current electricity, with resultant formation of chlorine on the anode and metallic intermedial sodium on the cathode.

This process[3] is in common use by paper makers and the cells are identical in operation with those used in the large scale manufacture of chlorine and sodium hydrate by the electrolysis of common salt. For the production of sodium hypochlorite liquors the apparatus is slightly more complicated and the cost rather higher than for the production of chlorine and caustic soda alone, but is nevertheless much more economical than buying sodium hypochlorite solutions from a manufacturer. The cost of electric current and common salt after the original expenditure on cells, etc., is all that need be incurred to ensure a continuous supply of sodium hypoclorite solution for bleaching cellulosic textiles.

The principle is that of producing caustic soda by the electrolysis of a solution of common salt with the evolution of chlorine which is then conducted back into the caustic soda to form sodium hypochlorite, thereby completing the chemical cycle and accounting for both metallic and acid radicles of the common salt.

Method: A bath containing a solution of common salt is placed at the top of the apparatus, the flow of salt solution

being controlled by a ball-float on the cistern principle. The electrolytic earthenware cell into which the salt solution is conducted contains a series of carbon electrodes which are supplied with sub-divided direct current corresponding to the number of electrodes in the bath. There is thus constructed an apparatus with no moving parts into which flows from the top a solution of sodium chloride and from which emerges at the bottom a solution of sodium hypochlorite.

Sodium Hypochlorite Bleach Liquor

Table 1 (Tex. Wor., Nov. 1954, p. 58) shows the quantities of chlorine, caustic soda and soda ash needed for the production of 1,000 galls. of bleach liquor at various strengths up to 85 gms. available chlorine per litre. The assumption is made that only enough caustic soda is used to give complete reaction with the chlorine, soda ash being added in sufficient excess to ensure stability. This excess is expressed in grams of actual sodium carbonate (Na_2CO_3) per litre as shown in Table 1.

Table 1
Soda Bleach Liquor from Chlorine and Caustic Soda plus Soda Ash

Available Chlorine Gms. per litre	Pounds per 1,000 Galls. Bleach			Excess Na_2CO_3 Gms. per litre
	Chlorine	Commercial 76% Caustic soda	Commercial 58% soda ash	
10	83·4	95·9	42·1	5·0
15	125·1	144·0	63·2	7·5
20	166·8	192.0	84·2	10·0
25	208·5	240·0	101·1	12·0
30	250·2	288·0	117·9	14·0
35	291·9	336·0	134·7	16·0
40	333·6	384·0	143·1	17·0
45	375·3	432·0	151·6	18·0
50	417·0	480·0	160·0	19·0
55	458·7	528·0	168·4	20·0
60	500·4	576·0	176·8	21·0
65	542·1	624·0	185·2	22·0
70	583·8	672·0	193·7	23·0
75	625·5	720·0	202·1	24·0
80	667·2	767·9	210·5	25·0
85	708·9	815·9	218·9	26·0

Activation and Decomposition of Sodium Hypochlorite

Atmospheric oxygen is inert (or practically so) and any bleaching action is almost imperceptible except over very long periods. On the other hand oxygen released from a bleaching solution is very active and it is obvious that some form of activation must take place during the bleaching process. Oxygen, as it is released from a bleach liquor, is "nascent" oxygen, i.e. it possesses a degree of chemical reactivity which is not normally present in the absence of conditions suitable to bring about bleaching or the removal of colouring matter from impurities in textile fibres. Such conditions may be enumerated thus:—

(1) Raised temperature.
(2) Acidity.
(3) Alkalinity.
(4) Catalysis.
(5) Presence of impurities which induce oxidation.
(6) Influence of light.
(7) Concentration of solution.

The reaction which takes place during oxidation of impurities is exothermic, i.e. heat is given off during the reaction and energy is lost by the chemical system, which can be measured by thermo-chemical apparatus. Sodium hypochlorite is itself very reactive and will decompose spontaneously. Such reaction is also accelerated very noticeably in the presence of light and particularly heat. The following equations indicate the progress of the reaction:—

1. $3\,NaOCl = NaClO_3 + 2\,NaCl$
2. $2\,NaOCl = 2\,NaCl + O_2$

The first of these is predominant but the second always takes place to some degree and is moreover accelerated by catalysis, e.g. the presence of iron, copper or other metallic impurities. Free alkalinity has a stabilising effect by reducing the degree of hydrolysis and also in limiting the action of atmospheric carbon dioxide. Stability is best preserved in the presence of approximately 2% of free alkali (caustic soda). For storage purposes solutions of sodium hypochlorite at about 30° Tw keep better than those of 40° or more. A cool, dark place is best for storage and containers should be securely stoppered to exclude dust and air.

Influence of Chlorine on Bleach Liquors

The energy of the bleaching action is conditioned by the content of active chlorine in the bleach liquor although the chlorine itself does not take any part in the actual bleaching action but may remain a constant quantity throughout the reaction period. The oxidation reaction is promoted and accelerated (as already noted) by a number of factors in some of which chlorine may play a very important part such as in the formation of hypochlorous acid and formation of the protein chloramines—both of which act (the latter catalytically) in promoting the oxidation of impurities.

The presence of acid for example in a solution of sodium hypochlorite will increase the amount of hypochlorous acid in the bleach liquor with consequent rapid acceleration of oxidation until a point is reached when the liquor becomes definitely acid. At this stage bleaching can proceed (within limits) without risk of damage to the material. The danger zone in hypochlorite bleaching is pH 7/8 and bleaching in either definitely acid or alkaline media will avoid this with consequent lessening of the risk of tendering.

Kauffman and others have shown that one very probable cause of tendering in hypochlorite bleach liquors is the presence of suitable activators. It was originally thought by these and other investigators that hypochlorous acid HOCl was the probable and direct cause of tendering during bleaching. It was also noted that as the bleach liquors became more alkaline the risk of tendering decreased and the conclusion was drawn that this was because of the reduction in the amount of hypochlorous acid in the bleach liquor. Further investigation revealed the fact that hypochlorous acid alone had little or no injurious effect on the fibre when used in varying conditions. From these studies there emerged the theory that bleaching solutions containing chlorine required the presence of an *oxidising agent*—in this case the *hypochlorite* ion and an *activator* the *hypochlorous acid*. Other activators were found, e.g. hydrogen peroxide and ammonia—the latter operating in the form of chloramine which must first be formed before activation can take place. Acid amides and amino acids, e.g. urea have a somewhat similar effect.

Importance of Protein Chloramines

The fact is now recognised that the cotton fibre itself is an active participant in the bleaching process. It has been shown that with the formation of protein chloramines[4] by reaction of the cotton fibre with hypochlorites there is created the possibility of activation of the oxidising agent by the chloramines. These bodies contain active chlorine which is similar to that contained in the hypochlorite bath but with a much slower reaction. In the presence of a hot alkaline solution of peroxide this active chlorine brings about release of oxygen with consequent bleaching of the brown colouring matter in the fibre.

In brief outline the foregoing facts led to the discovery and application of the so-called combined bleaching processes whereby a short treatment of the cotton with hypochlorites in the first stage for the formation of the protein chloramines was followed by a hot alkaline peroxide treatment for the oxidising or bleaching stage. This eliminated much of the scouring-washing-scouring-washing sequence which is commonly practised in the chlorine bleach, as well as pointing the way to a safer method of bleaching goods containing coloured yarns because it became possible to eliminate or greatly reduce the alkaline scouring which was the cause of bleeding of the dyestuff into the white grounds.

In B.P. 410,199 the use of a bleaching process involving reactions between protein chloramines and hydrogen peroxide is described. It is pointed out that by this means it is possible to avoid kier boiling with caustic soda as commonly practised with the chlorine bleach.

It is recommended that the material should first of all be impregnated with a solution of sodium hypochlorite containing 4 grams of active chlorine per litre and then almost immediately subjecting it to treatment in a liquor made up of:—

Hydrogen peroxide 40%	**3½ litres**
Caustic soda	**3 kg.**
Sodium silicate 36°	**3½ litres**
Water	**1,000 litres**

the temperature being kept at 90 - 95°C. for about four hours. Rinsing and subsequent scouring with dilute formic acid and final rinse, complete the process. It is noted that when the cotton is entered into the peroxide liquor about 75% of the chlorine present has been rendered inactive by reaction with impurities; the remaining 25% of the chlorine is active and brings about reaction with the hydrogen peroxide with consequent liberation of oxygen and promotion of the bleaching action.

Continuous Hypochlorite Bleaching

The following method is described briefly in an abstract (J.S.D.E., May 1950, p. 304): "A continuous bleaching process is proposed and laboratory experiments to test it are described. Three major steps are involved:—

(1) Cotton goods are padded with sodium hypochlorite solution of strength 1 - 4 g., available chlorine per litre at pH 8 - 9 and allowed to steep for 30 min.

(2) The material is thoroughly rinsed, saturated with 0·5 - 1·0% caustic soda and steamed for 20 - 30 min. After rinsing, the treatment is repeated with 3 - 4% caustic soda.

(3) The process described under (1) is repeated. The usual rinsing and finishing processes are then carried out. This process produces better whites and higher strength than those usually obtained with hypochlorite bleach methods."

It is obvious that in this process use is made of the buffering action of the impurities in the loom-state cotton for the protection of the cellulose during the oxidising of the natural colouring matter of the fibre, this reducing the risk of tendering. Degradation of cellulose is liable to take place where chemical control is absent and where bleaching is carried out after the kier boil, that is after the larger part of the impurities have been removed. It will be noted that it is claimed that higher strength goods are obtained by this method as compared with normal hypochlorite bleaching after kier boiling.

Chlorine Bleach for Bast Fibres

According to B.P. 371,494, chlorine generated by the presence of hydrochloric acid in the bath and therefore with hypochlorous acid also present, gives very good results in the removal of liquor or straw constituents from bast fibres, when used in conjunction with a prior scouring treatment in sodium carbonate 4 - 6% solution at the boil for 2 - 3 hours. The pH should be approximately <5 and the bleaching treatment followed again by a further infusion for 1 hour in a warm solution containing 7 - 8 gm. per litre of sodium carbonate. This is followed in turn by another treatment in a hypochlorite liquor of about half the strength of the first liquor but which is either neutral or slightly alkaline—with subsequent rinsing and a final infusion in soda ash as previously indicated.

Such a sequence of treatments if properly carried out is said to produce a half bleach and a material free from lignin with tensile strength unchanged. It should be noted that subsequent experience has shown that the second treatment should preferably be on the alkaline side and not neutral as also suggested because fibre tendering is now known to be less likely to occur at the extremes of pH either acid or alkaline, chlorine bleaches being most active in the neutral pH zone.

Bleaching Linen with Hypochlorites

Used in conjunction with alkaline scours and as a repeated and alternating treatment—sometimes followed by peroxide treatment, hypochlorite bleaching is widely used for the bleaching of linen goods. Older methods employed lime boils under pressure followed by a sequence of souring with hypochloric acid, washing and a further alkali boil in caustic soda and soda ash. Then came bleaching with hypochlorite followed by washing and souring. These processes were repeated in various (and milder) forms until the required degree of whiteness was produced.

Nowadays, such processing may be shortened and cheapened by the use of an intermediate bleach with peroxide following the hypochlorite bleach. And in most cases this can safely replace another alkali boiling treatment with a good effect on cloth weight and degradationi Bleaching with sodium hypochlorite is carried out in the presence of 3 - 3·5 gms. of chlorine per litre at or near pH 7 at which point the bath is most active. Above this concentration and up to 10 gm. chlorine per litre there is no marked improvement in the white but degradation of the fibre shows a progressive increase.

The bleaching of linen cannot be carried out by hard-and-fast rules because of the wide variety of fibre produced, not only in growing but as a result of the variations in retting procedure. It is common to find that a method which gives perfectly good results on one lot of goods will only go halfway towards the production of the same result on a succeeding lot because of these variables.

It has been found, however, that linen fibres hold traces of chlorine tenaciously and these are hard to wash out. They may be present as free chlorine or be in the form of chlorinated bodies in the fibre, both becoming

active during further treatments with peroxide. For example it has been found that degradation of the fibre increases with the amount of residual chlorine, during peroxide treatments. If the pH of peroxide is kept in the region of 11 - 12 better colour and less degradation will result than at progressively lower pH values, when used as a subsequent treatment to hypochlorite bleaching.

Hypochlorite v. Hydrogen Peroxide

It is generally agreed that the cheapest cotton bleach from the point of view of chemical costs, is the hypochlorite bleach following a caustic kier boil. It has been estimated by Satterfield and others that the comparative costs are roughly as follows (1954)—2·50 - 3·50 dols. per 1,000 lb. cotton for peroxide bleach and 1·50 - 2·50 dols. for the hypochlorite bleach. It has also been pointed out that so far as tendering is concerned there is no reason why a hypochlorite bleach properly controlled should not give perfectly satisfactory results. Indeed, it has been shewn very clearly that chemical control is perhaps the most important factor in any modern bleaching system and where it is properly carried out the method of bleaching would seem to be of secondary importance so far as fibre degradation is concerned.

It is also becoming more generally recognised that kier boiling can in many cases be omitted where the peroxide bleach is used as a perfectly satisfactory bleach can be obtained by a one-stage treatment making use of the impurities in the cotton fibre as additional stabiliser for the bleaching action of the peroxide. In this process the chemical costs are rather higher than for the caustic boil and hypochlorite bleach but it will be found that the saving in time, wages and steam will more than counterbalance the outlay in chemical costs. Moreover, if proper use is made of waste peroxide liquor from the bleaching process for a pre-scour before bleaching, very considerable savings in desizing materials and in peroxide itself can be made. It should also be borne in mind that a great deal of intermediate processing such as anti-chloring, souring and washing can be omitted when using the peroxide bleach as compared with the hypochlorite bleach and this again tends to reduce costs in wages, water and chemicals.

Hypochlorite in "Clearing" Treatments

It is plain that hypochlorite can be very useful in cases of slight staining or bleeding of dyestuffs which are of poor fastness to chlorine. For example, in the case of woven coloured borders or stripe effects in piece goods bleeding may occur during peroxide bleaching with resultant staining of the white portions of the goods. If the dyestuff used has poor fastness to chlorine then advantage may be taken of this fact to "clear" the stained or tinted portions of the goods without unduly affecting the rest of the colour in the woven effects, especially if these are in deep shades. Examples of this are found in such dyes as certain vat green and blues.

It is also not unknown for treatments of this kind to be applied in dyeing and printing where the shades in question have come up rather stronger than anticipated or maybe are too red in hue. If a hypochlorite treatment is given in these cases the shades can be considerably reduced in depth and vat blues will turn greener in shade according to the strength of the hypochlorite treatment given. It is, of course, obvious that such treatments must be limited in strength so as to avoid tendering of the goods in question.

In printed goods in particular use may be made of hypochlorite "clears" for various purposes of this kind, in the "greening" of vat blues as just pointed out, as well as in the removal of certain kinds of "mark-off" stain in printed pieces. In the latter case the hypochlorite treatment is only applied when all other remedies have failed such as re-washing the goods in boiling soap liquors, or local removal of the colour stains by hand scrubbing. Clearing of piece goods should not make use of hypochlorite liquors of greater strength than $\frac{1}{2}$° Tw. and should be carried out by steeping the goods for several hours in cold liquors. Sometimes use is made of steam chloring, i.e. by padding the goods in a weak hypochlorite liquor and subjecting them to a short steaming treatment in a wooden box with a few rollers. This can further be modified by using the padding treatment followed by drying cylinders, but this is considered to be too severe and should only be resorted to when all other remedies have failed. Treatments of this kind can also be applied to certain vat colours which have accidentally been over-reduced in dyeing or printing such as vat yellow G. A hypochlorite treatment of the foregoing type may be very effective in restoring the brilliance of the yellow colour in such cases.

References

(1) Inman: "Bleaching Agents for Textiles and Paper Pupl" Jour. Soc. Chem. Ind., Dec. 30, 1922, p. 368.
(2) Ullmann: "Bleaching Solutions of Chlorine and their Self-Production." Tex. Col., May 1943, p. 9, 227.
(3) Downie: "Continuous Hypochlorite Bleach Production." Silk and Ray., Aug. 1938, p. 766.
(4) Kornreich: "Modern Bleaching of Cotton" Dyer and Tex. Prin., June 16, 1939, p. 527

New Publications

THE USE OF ECONOMIC STATISTICS. Conrad Blyth. George Allen & Unwin Ltd., Ruskin House, Museum Street, London. (price: 28s. cloth; 22s. boards).

Many of the books published hitherto on statistics and statistical methods have tended to lack realism in their presentation of the subject. As befits a book issued in the excellent "Minerva Series" of Students' Handbooks, this introduction to the sources of economic statistics is intensely practical in its approach, as each chapter examines a typical problem in applied economics and gives a detailed explanation of the sources and methods to be employed in its study. These problems include the present position of the cotton industry; the effect of hire purchase on car sales; and the extent to which prices have risen since World War II. Not only is the student introduced to the standard British sources, both in the main text and in the Reference Table of United Kingdom Ecomonic Statistics which is a guide to the most useful and accessible statistics normally required, but also American and European statistical sources are included. In addition, introduction is given in graphical and tabular presentation and such aids to inspection as moving averages and scatter diagrams. Mathematical knowledge is not needed and mathematical symbols are not used. Exercises requiring detailed working through of examples are provided at the end of each chapter. A ready sale can be forecast for this book which is logically designed and capably written.

* * *

FIRE PROTECTION IN FACTORY BUILDINGS (FACTORY BUILDING STUDIES No. 9.) Published for D.S.I.R. by H.M.S.O. (price 3s. 10d., post free).

Fire in industrial premises is a serious hazard and its prevention should have priority with factory management. This new report provides for factory managements and building designers an introduction and a guide to the various legal requirements. It also indicates what precautions may be taken beyond those required by law to reduce the hazard of fire breaking out and spreading within a factory building. Precautions that should be adopted for the safety of personnel, in case of fire, are also considered. Technical appendices deal with common causes of fires in factories, standard fire resistance tests and the behaviour of materials and elements of structure under fire conditions.

Agilon D Yarns for Weft Knitted Outerwear*

A summary of some of the recommendations for knitting, finishing and making-up procedures which yield the best results in nylon outerwear knitted with Agilon D yarns

AGILON D is a continuous filament yarn having substantially the same amount of bulk as normal Agilon. But, while bulk in Agilon is developed mainly in the fabric, in Agilon D it is largely present in the yarn and fully developed during wet finishing. Agilon D fabrics knitted from either dyed or grey yarn have a full handle, good surface texture and good recovery after stretching; stitch clarity in ribbed and patterned designs is very satisfactory.

The knitting technique differs only slightly from that required for other bulked nylon yarns; close co-operation between the knitter and the finisher is nevertheless strongly recommended.

Agilon D fabrics knitted on multi-feed machines under controlled conditions are notably level after dyeing. The explanation lies partly in the uniform heat treatment given during yarn manufacture, partly in the achievement of equal relaxation in individual yarn ends. Dyed yarns are also satisfactorily level and show normally no appreciable stripiness in plain fabric.

Yarn Supply.—The yarn is suitable for knitted fabrics and garments made on circular, flat-bed and full-fashion machines. It can be used in either single or folded form, or in multiple numbers of ends per feeder. It is supplied ready oiled and can be knitted satisfactorily direct from the package without special preparation. During withdrawal from the supply package the yarn is relatively straight, not bulky.

Fabric Appearance.—Fabrics can be produced with distinct characteristics: one, a soft, lofty handle with a full appearance—suitable for general knitwear; the other a firmer but still soft handle and silk-like appearance—more suited to dress-wear and lightweight cardigans. Fabric properties depending on the stitch shape can be closely controlled by choosing the correct knitting and finishing conditions.

To obtain a bulk and fullness similar to that of high-grade staple, the settings in Table 1 should be used as a guide. The firmer silk-like handle can be obtained by knitting about 15 - 20% tighter than the settings given.

Knitting.—The bulk and handle of Agilon D fabrics can only be fully developed at finishing if the fabric is knitted more slackly than would be advisable with yarns made from conventional fibres.

Stitch density of the machine will increase by about 30% during finishing. The dimensions to which the fabric is knitted should, therefore, allow for a decrease of about 35% in the length (about 30% in the case of dyed yarn) and an increase of about 5% in the width. It is quite possible that different dyes will give slightly different dimensional results—an added reason for close co-operation between knitter and finisher. Basically, however, dyed and grey yarns call for identical knitting techniques.

To achieve an undistorted loop structure in the final fabric, and to reduce knitting faults, the yarn should be knitted at the lowest tension which allows full control. Yarn contact points should, therefore, be kept to a minimum. Under these conditions, Agilon D will be found to give exceptionally few knitting faults.

The weft knitting machines on which Agilon D has so far been proved are shown in the table. Yarn deniers suitable for various machine gauges are given, together with the recommended fabric quality in stretched courses per inch in the grey state. The figures are approximate, but close co-operation with the finisher will ensure reproducible results and give the quality required. These settings give a full and soft handle (suitable for general knitwear).

Table 1. Recommended gauge, denier and stretched courses/inch

Machine	Gauge	Yarn denier	Courses/in. (stretched)*
1/1 Rib-circular and Flat-bed	3½	1,000	4½
	5	800	6
	7	550	10
	10	420	15
	12	280	18
	14	210	20
	16	170	22
	18	140	23
Interlock	12×12	200	11
	14×14	150	12
	16×16	120	14
	18×18	120	16
	20×20	100	18
	22×22	70	20
	24×24	70	22
Plain web ..	12	400	11
	14	320	12
	16	270	14
	18	220	16
	20	180	18
Straight bar ..	18	500	13
	21	400	13
	27	280	15
	33	240	15

*** The figures apply equally to grey fabric and fabric knitted from dyed yarns. The best method of counting is: hold the fabric folded along the wale (lengthwise) between the first finger and thumb of each hand and stretch fully; then count the number of loops along the edge.**

On fine gauge rib, interlock and straight bar machines, increasing the stretched courses per inch by 15 - 20% yields a silk-like fabric.

On rib transfer machines, doubled yarn has proved advisable for the rib structure; indeed an increase of 150% in the yarn denier (as compared with the yarn denier of the rest of the garment) be found not too much.

For full fashioned garments, knitting the ribbing two gauges finer than the actual garment greatly improves appearance.

Pointers for Trouble-free Knitting.—(*a*) Reduce the number of guides between supply package and knitting elements to an absolute minimum. Where possible, use ceramic materials for these guides; all guide eyes must be free from cracks or other roughness.

(*b*) The knitting elements must be in good condition to avoid filamentation. On latch needle machines, needles with cracked shanks and badly fitted latches should be replaced; worn and cut sinkers should also be replaced. On full-fashion frames, sinkers and dividers should be free in the tricks; worn sinkers can cause lines in the fabric.

(*c*) Take-up rollers should be smooth, clean and undamaged.

(*d*) The yarn and fabric must be under positive control during knitting. Yarn tension measured on entry to the feeder should not exceed 5 grams, whatever the yarn denier. Fabric take-down tension should be as light as practical.

(*e*) The quality setting should ensure a long stitch to allow for closing up during finishing.

(*f*) Should dropped stitches occur during knitting on circular knitting machines it is advisable to crimp the needles—by bending the shank slightly—in order to apply more tension when the needle moves within the tricks. (If bulked yarn is knitted slackly it offers little resistance on the needle during knitting.) When the needle rises to the dwell position after leaving the stitch cam the needles can jump if loose in the trick. The consequence is that loops may slide under the latches, causing dropped stitches.

(*g*) Differences in individual feeder settings, particularly when knitting plain structures (e.g. plain interlock), can cause stripes; care should be taken to prevent this defect and, if it does occur, to avoid confusing it with faults due to variations in yarn processing. Wherever possible, an instrument should be used to determine the amount of yarn knitted at each feeder; this will determine the correct value, either of the length of yarn consumed in a given time, or of the speed at which the yarn feeds into the machine during the knitting process.

(*h*) Garments knitted on full-fashion machines which only have sinker movements tend to be less prone to wale stripes than garments knitted on sinker divider machines. The jack spring cam can be advanced so that the pressure is completely off, as the sinkers and dividers then kink the yarn around the needle for the loops. Release the cam locking set-screws, and advance slightly to obtain the correct timing required by individual machines.

(*i*) When Agilon D yarn packages are changed on full-fashion machines it is always advisable to do so before starting up a new panel or sleeve. This not only saves production time (as, on changing one cone, the whole machine has to be stopped) but also eliminates a knot which could show up in the garment if not carefully tied. (The yarn residue on the cone can easily be rewound and used up with the other Agilon D ends on a machine where ribs and trimmings are knitted).

(*j*) Knots must be tied without pulling the yarn ends unduly in an effort to reduce the knot size and so over-stretching the yarn. If Agilon D yarn is over-stretched, the bulking potential

* *From Advance Report No. 32, issued by British Nylon Spinners Ltd.*

is reduced, giving a different stitch formation which appears as a yarn fault in the finished garment.

(*k*) It is further recommended that a multiple number of ends are used on the full-fashion machine, rather than one single end of folded yarn which may show differences in the fabric if the yarn has been knotted at coning. The use of several yarn ends evens out any yarn tension differences within or between packages. Separate tensioners—"fiddle type"—are recommended.

Preparing fully fashioned garments before finishing.—It is usual to close the shoulders, sleeves and side seams of fine gauge garments before bulking, setting and (when applicable) dyeing. With coarse gauge hand flat garments, blanks and sleeves may be left separate and forwarded together to the finisher.

Coloured yarns for linking and making-up piece-dyed garments can best be obtained by knitting panels on a single feeder machine and having them bulked and dyed with the garments to the same shade. The yarn is then unravelled and used for making up. Agilon D or any other bulked nylon yarns will be found suitable.

Fabric and Garment Finishing

As with many bulked yarns, most of the filament crimp is temporarily removed by tension during winding and knitting. Although much of the bulk is subsequently recovered on contraction of the yarn in the fabric, a finishing treatment is necessary to develop it fully.

Handling the Fabric.—To avoid snagging, any surfaces with which the fabric comes into contact should be smooth. The same general precautions taken when handling other nylon fabrics should be observed.

Bulking Techniques.—The first finishing operation is a bulking treatment. This is necessary to develop the full characteristics of the fabric; it is convenient to scour the fabric at the same time. To ensure adequate bulking the fabric must receive continuous agitation in equipment such as paddle, rotary drum or winch machines.

When winch machines are used for circular knitted fabric there is always some lengthways tension in the fabric. This limitation on shrinkage prevents the fullest development of bulking, but can be useful for fabrics with rib structures. For maximum bulking it is preferable to bulk circular knitted fabric in paddle or rotary drum machines, where it is free to relax.

Garment blanks should also be bulked in either rotary drum or paddle machines; this will ensure a soft, full handle and attractive appearance. Over-loading may cause uneven bulking and creasing.

Scouring and Bulking Procedure.—Fabric and garments processed should be loosely packed in close mesh bags to prevent snagging. Freedom of movement in the liquor is essential to achieve uniform and adequate bulking.

The bath is prepared with the detergent, and the fabric put into the cold bath. The temperature is then slowly raised to 40° - 45°C. (104° - 113°F.) over a period of 15 minutes. The fabric is then rinsed, first in warm water and then in cold, hydro-extracted and dried. Drying should be done with as little tension in the fabric as possible; brattice or loop driers are satisfactory. Garments are normally dried in a tumble drier in which temperature need not exceed 60°C (140°F.).

More severe scouring treatment may sometimes be necessary to remove soiling matter. This is done after the bulking treatment has been completed; the temperature should not exceed 60°C (140°F.).

Setting.—All fabrics and garments made from Agilon D should be set, preferably by steam in an autoclave. Setting increases the resistance of fabrics to creasing during subsequent wet processing; it also gives improved stability, recovery from stretch and distortion, and ensures a satisfactory finish.

Circular knitted fabrics are set either batched on a roller or plated on a tray. (Beforehand, it is generally advisable to subject the fabric to a gentle steaming to remove dry creases: it may be convenient to do so whilst batching on a light calender.) Steam setting pressures of 25 - 27 lb./sq in. are satisfactory; it is important to observe uniform conditions. Steam autoclaves fitted with vacuum devices are advantageous. The duration of treatment depends on the amount of fabric being set but should be regulated to ensure through and uniform penetration by the steam. To avoid setting lap creases in plaited fabric, the number of layers must be restricted according to the weight and construction of the fabric.

Garments also may require steaming, or steam pressing to remove creases before pressure steam setting. A pressing treatment, however, may be undesirable for garments made from heavy denier yarn and for fancy patterned effects. During setting, it is suggested that the crease-free garments are laid flat on trays in the autoclave, and stacked one on top of the other. The number of garments that can be stacked together will depend on their weight and construction, but may be of the order 6 - 12 for the lighter deniers and 3 - 6 for the heavier deniers.

Dyeing.—After setting, the fabric may be re-scoured if necessary. The choice of detergent and scouring conditions will depend on the nature and degree of soiling. The set fabric is then bleached or dyed by the conventional methods for nylon. After dyeing, the temperature of the dyebath should be gradually reduced by the slow addition of cold water to avoid shock cooling and to minimise risk of creasing. The final application of a softening agent gives slight lubrication to the yarn and contributes to a soft, attractive handle.

Dyeing Agilon D Yarn

Full bulk, loftiness, softness of handle and good recovery in fabric knitted from dyed Agilon D yarn depended on the yarn having been wet processed in a relaxed state, with some mechanical agitation. This is best achieved by scouring, dyeing and softening the yarn in hank form in a rotary hosiery dyeing machine. Hanks scoured and dyed in Obermaier type machines do not develop satisfactory bulk; the deficiency may not be observable in the yarn but will be ultimately revealed in poor fabric recovery Scour-relaxing the hanks in a rotary machine and then dyeing them in an Obermaier type machine yields better bulk, but is still not so good as the method described below.

Yarn Preparation.—Depending upon the winding equipment available hanks of Agilon D yarn up to 1 lb. in weight may be prepared. A 48 in. circumference wrap reel has been found suitable for 10 oz hanks, and a 54 in. reel for 1 lb. hanks. The hanks are laced loosely in six places. Up to 50% shrinkage in length, with a corresponding increase in bulk occurs during scour-relaxing and dyeing; the lacings must, therefore, be loose enough to allow for this considerable bulking and all-important movement. If the yarn is constricted it will develop and dye unevenly.

The hanks are placed in mesh bags (for which "Terylene"[2] is suitable). Although it is possible to process two 10 oz hanks in a bag measuring 18—24 in., there is the danger of yarn entanglement during the final tumble drying, and only one hank per bag is recommended.

Scour Bulking.—The hanks in their closed bags are placed in the compartments of a rotary drum dyeing machine. Some freedom of movement such as that given by a liquor/goods ratio of about 30 : 1 is advisable.

For example, 5 lb. of yarn packed in each compartment of a four-compartment 60 gallon machine has been found satisfactory. Dissolved detergent is added to the bath at room temperature, which is raised to 60°C (140°) over 15 min., and there maintained for a further 15 min., with continuous rotation. A suitable scouring liquor contains ½ - 1 lb. of a non-ionic detergent and ½ lb. soda ash per 100 galls.

After scouring, the hanks are rinsed thoroughly, first in warm and then in cold water.

Dyeing.—After rinsing the hanks are dyed in the same machine. The selection of dyes and dyeing method will depend on the shade required, on later fabric finishing treatments (for instance, pressure steam setting), and on fastness to end-use conditions. Disperse dyes, particularly in medium or heavy shades, are not completely satisfactory, and it is recommended that faster dyes of the acid, "Nylomine"[1], metal complex, reactive or chrome classes be used. Recent advances using dyebath additives afford further means of obtaining fast level shades on filament nylon[3]. "Procinyl[1]" dyes are also capable of giving good uniformity with excellent wet-fastness. Agilon D yarns has, however, been dyed successfully using conventional techniques and dyes, showing that it is, inherently a level dyeing yarn.

Softening.—Thorough rinsing should follow dyeing. The yarn is then treated for 15 - 20 min. in a solution or dispersion of a suitable softening and lubricating agent, which assists during backwinding and subsequent knitting operations.

Drying.—Hydro-extraction follows softening with no intermediate rinsing. The yarn may be finally dried on brattice driers, in ovens, or in tumble drying machines.

References

(1) A trade mark of I.C.I. Ltd.

(2) The several methods mentioned here and other proprietary dyestuffs are discussed at greater length in advance Report 31.

ADHESIVE FOR BONDING P.V.C. MATERIALS

Mr. A. A. Scott (chief chemist, of London Adhesive Company Ltd., Arlington Works, Arlington Avenue, N.1.) has announced that after exhaustive tests of many different formulations a new Clam adhesive No. 77 is to be marketed which, it is claimed, will solve the problem of bonding P.V.C. materials.

This adhesive which is a synthetic resin solution has taken some five years of experiment and development to produce. It will be particularly useful in solving many problems where P.V.C. backed materials are used in manufacturing processes or as furnishings and mural coverings.

Problems in Processing Wool and Man-Made Fibres on the Worsted System*

Answers must be found to many vital questions before management can decide the extent of new plant and policy. It is also important to remember that any change to new machines, methods and techniques cannot be assessed solely in terms of yarn properties

By P. P. TOWNEND, B.Sc., Ph.D., F.T.I.†

WHAT I had in mind when I chose this title was the dilemma we are in as regards the next step. Prior to 1945 we had the Bradford, cone and Continental systems of drawing with conventional drafting on the frame or mule, but now, in drawing, we are faced with the old Bradford system, the cone system, the new Bradford, the old Continental porcupine system, the modified Continental using rubber gill boxes, the new Continental system, as shown at Milan, and the American system, and no doubt when we come back from Moscow in 1961 we shall have another system. And in spinning too, the same diversity exists; drafting with carriers and tumblers, drafting with compressible tumblers, drafting with aprons, drafting with flumes. All this is confusing and one can understand the hesitancy of any spinner holding-off investing large sums of money, because he is not sure whether he is doing the right thing.

To help make up your minds, I am going to pose a lot of questions and anyone that can answer them should not be reading this.

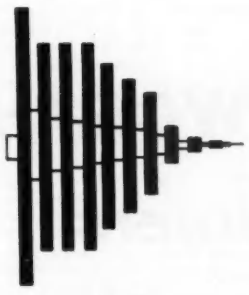


Fig. 1

In Fig. 1 the white vertical heights represent the weight per 40 yds. of material leaving the various machines from Noble comb through top finishing, gilling, drawing and roving, and the black vertical heights represent the weights entering each machine. This diagram demonstrates how we thicken up and then thin down our cross-sectional slivers, and one is bound to query this practice. I realise that the present arrangement is more practical with our present industrial structure, also that this technique allows mixing and levelling up of comb slivers besides making a thick easily transportable top, but I would ask you to ponder whether we couldn't achieve this by treating comb slivers as if they were top slivers using bumped tops in a vertical set up. It might be argued that production would suffer, but with gill boxes running at 4,000 drops/min. this is now debatable Of course, this idea isn't new but previously we hadn't super high speed gills or autolevellers, and therefore we ought to look again at an old problem in the light of modern machine developments.

So far as man-made fibres are concerned I think the day when these will be carded gilled, combed and gilled is passing in the light of Greenfield, Pacific, Turbo and such like converters which give us nep-free slivers. I think the technique of cutting variable staple tows is to be welcomed as contributing to a more uniform distribution of these fibres in the ultimate yarn but only because it is easier to break up clumps of non-coterminate fibres in a drawing device and not because it is easier to produce a uniform yarn from variable length staples.

At the same time one cannot resist asking why 100% man-made fibre yarns made from uniform staples are not infinitely more uniform than all-wool yarns where the staple length varies to a very large degree. Whilst on the subject of man-made fibres, I think we should query the advisability of making tops where the fibres consist of three groupings, say 4½, 4 and 3½ in., since in effect we still have co-terminate ends. One would have thought that a better distribution in mixing with wool would obtain if the fibre lengths ranged over all lengths from 4½ to 3½ in.

Mixing

As I see it, one of our outstanding problems is to devise a mechanism which will mix fibres, either of colour or quality or type, in one operation. The fact that we have to use pre-mixing with some prior to the Raper Auto-leveller surely reduces the advantages to be gained from this invention. When one considers the action of a gill box it is evident there is practically no mixing in any one gill since there is no sideways movement of fibres, so that a series of black and white slivers entering a gill emerge in the same order except that the width of each original sliver has been reduced and so by an accidental super-imposition in the next gill some degree of mix is attained. But it takes six or seven such gillings, depending on such factors as whether the blend is all-wool or wool/man-made fibre or on the proportions of colour, to bring about an intimate mix. And whilst this degree of mix is not necessary at the gills, because of the extra mixing in the drawing, one is bound to conclude that the adoption of Raper gilling together with A.S.D. spinning will necessitate better mixing before the Auto-leveller gill.

It would seem that the New Bradford process will force us to re-think about pre-mixing. For instance, how is the degree of mix, using conventional gills, affected by the number and thickness and the disposition of the slivers going into the mixing device? Would we get better mixing if we mixed thin slivers, say 80 drams, and oscillated the ends as they entered the back rollers? Would this movement, which need only be the width of any one sliver, interfere with the parallel order of the fibres? Could we maintain the position of the slivers? Should we use a take-off mechanism similar to the Pacific Converter—would this increase the mix?

It may be that some of the space saved by the elimination of drawing machinery will have to be taken up by some pre-mixing device such as is made by Duranitre. This machine has two drafting devices in the one operation; the first one uses a high speed gill and the second heavily weighted drafting rollers with a controlling roller between the two. At the same time advantage is taken of sandwich blending; although I must say my experiments with sandwich blending whilst giving an apparent improvement in the early stages have not shown any material improvement at the end of the drawing. The interesting fact that we can draft twice in the same direction without any obvious ill effects

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* *From papers given at a conference of the Worsted Spinners Federation and to Halifax Textile Society.*

† *Senior Lecturer in Yarn Manufacture, Dept. of Textile Industries, Leeds University.*

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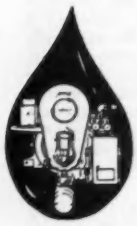

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is, I think, something which we must re-investigate. It has always been laid down that wool must never be drafted twice in the same direction, but when that rule was made, seven of a draft was a maximum in spinning botany wool and it may be that our improved engineering techniques will allow us to take new liberties.

So far we have accepted the gill as the only mixing unit, but I am not sure this need be so. It seems to me that we can never really bring about a maximum mix in a minimum time while we use fallers with their restricted horizontal plane. Surely a better mix would follow if we used some circular device in which we ran and drafted the ends. This obviously has limitations since it is difficult to conceive of such a device and one is driven back to flanged rollers and the problem of coping effectively with a heavy sliver, since production is as important as mixing. Nevertheless I intend trying this idea since, in my opinion, one is likely to get much better mixing when the fibres are contained in an orifice rather than spread across a line. At the same time we have to recognise that the gill box enables us to piece and we can't do without that, unless of course we feed from large containers. But with our present set-up the gill is necessary and after that we have to decide whether we use twist and wind onto bobbins with all that they imply such as washers, drag and some 12 lb. per bobbin, or we use gills with a large can capacity.

Detectors

Coming now to the process of converting tops to yarn, I would like to pose some queries. I have already suggested the possible displacement of gills by flanged rollers, but assuming we retain gills then it would seem that auto-leveller devices have become an integral part of the first machine in the set. So far as I could see at Milan, every machine maker has adopted this device and whilst one can only get an impression at an exhibition, it seemed to me that the British device was far simpler than any other make. I think that the continued use of a mechanical detector is to be preferred to the electrical systems shown by the Continental machine makers. This latter point raises a fairly large issue so far as future drawings and spinning is concerned. It seems to me that the extra skills required to maintain one electrified machine will not be worth the advantage gained over the purely mechanical system.

Whilst I am not decrying in any way the inclusion of electrical control circuits in our machinery, I am saying that if we adopt this technique then we must do it on a scale sufficiently large to make it worthwhile, since this type of apparatus calls for skills which are not common in conventional textile processing. And further we must see that the electrical control will do the job in a far better way than the mechanical one, otherwise I do not think it will succeed in our particular field.

Coming back to the Auto-leveller type of gill I have wondered whether our present system of detecting the variation in the weight of the in-going slivers allows us to take full advantage of the faller set-over and causes us to use intersector gills which are more expensive than the open type. As regards faller speeds, whereas 600 drops per minute were customary, we now think in terms of 1,000 - 1,500 drops, due presumably to greater precision in engineering lighter fallers and harder wearing metals. We now have to ask ourselves whether we want higher speeds than these and, if so shall we generate so much static in gilling that we shall get more trouble with roller laps. And, assuming we can get over that problem with anti-static oils, can we run conventional fallers at higher speeds than at present?

To overcome this problem must we resort to a different type of faller as has been done by O.T.O, Melara who have used chains to carry the fallers or should we use conventional fallers and triple or quadruple screws as, in the case of Mann, or should we adopt the endless chain faller as in the case of H.M.G. where speeds of 4,000 drops are achieved? Very much higher faller speeds might conceivably result in more fly, dirty fallers and screws. Again, can we overcome the noise problem in gilling? Does noise matter? Whilst I would welcome a reduction I never see any signs of operative discomfort from this source. A diminution might conceivably result in a better class of operative, although I very much doubt it.

One doesn't need to advocate the adoption of spray devices for adding oil or emulsion at the gill, especially in view of the trend towards more shortened drawing processes; it is only necessary to ensure, because of the almost transparent oil droplets, that the operative knows when the spray is working. Since this spray system has been adopted because of the shortened drawing process, it would seem advisable to add the oil before, rather than after, the gill in order to bring about a better distribution. One other query springs to my mind; in view of the present use of anti-static lubricants, can we cut down the oil content of a top to 1½%? Whilst it was demonstrated some years ago by Mr. J. Barritt that 3 - 4% was the best figure[1], I think we should re-examine this question in the light of modern developments.

Drawing

Turning now to drawing, to what extent is the character of a cloth or knitted fabric dependent on the system of drawing and spinning and to what extent on the character of the raw material? The answer to this question is the key to all future developments. In other words, can one obtain the same handle in a cloth by drawing and spinning the same wool on any drafting system, viz., open Bradford, new Bradford, Pin drafting, conventional Continental, Rubber gill boxes or new Continental?

It seems to me that the problem resolves itself into several parts. First, is the characteristic leanness of a conventional drawn and spun Bradford yarn due to the fact that it has been tightly wound onto bobbin after bobbin and only released for the short period as it leaves one bobbin to be drafted and wound on to the next bobbin? Would we get the same effect if we deposited it into cans at every operation as, for instance, in pin drafting or wound it loosely on to balls as in Continental drawing? I would think that the former winding onto bobbin after bobbin would give a straighter fibre in the roving as, for instance, where the same carded wool was backwashed, gilled three times, French combed and gilled a further three times, but in the one case the wool was wound onto a ball on every occasion and in the other it was dropped into a can and allowed to contract after its drafting process. Now what we have to decide is, if we use can drawing, whether the draft in spinning will pull the fibres out to the same extent as they would be after some seven drawing processes, and, if so, whether the spinning twist is sufficiently strong to hold these fibres taut.

This question must also be answered if one is to change over from conventional to new Bradford drawing since the latter as you well know, has one delivery into a can and two others onto a bobbin followed by A.S.D. spinning. And here again, does this latter form of drafting mechanism with its high withdrawal force compensate for the omission of several drawing processes? Or again, if this is not so, would a storage period in a tightly wound form bring about that same degree of straightness? Then considering the extreme case, would one obtain the same handle and character from a cloth made from twisted and twistless rovings spun on the same frame? It may be, of course, that the handle of a cloth is more dependent on the techniques of the finisher than those of the spinner.

I have asked a lot of questions but I feel that the answers must be found before one can go forward with any new plant. And it must be evident that the change-over to a new technique cannot be assessed solely in terms of yarn properties. The end point is the finished fabric and so it may be that the horizontal form of integration common to our worsted industry is a deterring factor in modernising plant because it is not easy to carry yarn forward to grey cloth and grey cloth forward to the finished state in two other mills and retain like conditions for each trial.

Reversing our thoughts, there is one question which I think the spinner must answer in order that the comber might be guided in his plant re-organisation. This concerns the length of fibre and the form the deviation from the mean should take. As you know, the comber is being urged to think in terms of solvent scouring in order to decrease fibre breakage in carding, which will obviously result in a squarer top. Now the question arises how square does a spinner want his tops? Do we want a tremendous improvement in diagram or is the present set-up satisfactory? And supposing we get a much squarer top, will this materially affect ease of processing and such yarn properties as strength, elasticity, uniformity etc.? And again, if we get no fibre breakage in carding and hence less noil in combing, would this affect the type of cloth made in the woollen industry? I think we should be able to answer these questions in no uncertain manner.

The trend in drawing is, I think, or should I say, the machine makers would wish to see, a Universal drawing system, and I think worsted spinners would welcome this too, providing that this system could cope effectively with the variety of fibres and fibre dimensions which are converted into yarns. What drafting devices have we got? If you consider pins, then we have fallers and porcupines and I think we can assume that the porcupine is on the decline. It was interesting that at Milan, where all

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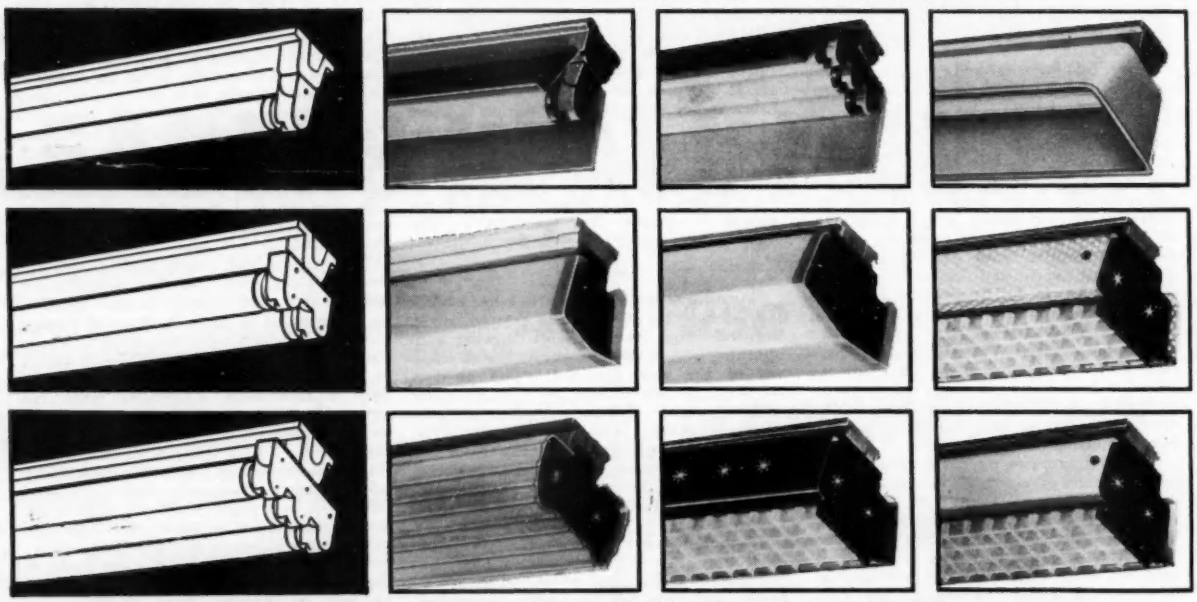

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the Continental machinists were showing, there was only one porcupine box.

Then consider drafting devices for slubbings. These fall into three main classes: rollers, aprons and flumes. Rollers, as plain solid bodies, have little to recommend as drafting agents for it is obvious that fibre control during drafting must be limited by the unyielding surfaces. Since slubbings under pressure are ovoid then a pressure suitable for controlling the central portion will allow the side fibres to slip through and a pressure suitable for controlling the side fibres must be far too heavy for the central ones, and so one has to compromise on pressure, thickness of sliver and draft.

Roberts have recently incorporated into their Arrow spinning frame Susson's top carrier roller of compressible rubber which seemed to me to be an advance on the ordinary solid tumbler, since it would accommodate itself to the variable cross-section of fibres. But here again we have to ask ourselves whether we are right in continuing to run tumbler rollers which are in effect driven by the fibres instead of going forward to positively driven rollers. So far as aprons are concerned, these have found a wide use in spinning machinery and have enabled us to increase the draft, apparently due to increased fibre control, but one is always worried about the tensions one has to exert on the apron for efficient driving and the fact that every apron must be of like dimension if they are all to be driven from the one shaft, and of course there is the ever present problem of joints to contend with. And, of course, if they are tensioned tightly for running purposes then in that proportion do they cease to mould themselves to the contour of the sliver being drafted. All of which points to the fact that the only really logical drafting device is one which will exert uniform pressures on all the fibres and that ideally is an orifice. But since this arrangement would present difficulties in drawing fibres forward, then I am afraid we shall have to compromise on flanged rollers, with or without flumes.

This, I think, is the shape of things to come: we shall have flanged rollers without flumes for the thicker slubbings and flanged rollers with flumes for the thinner slubbings. With the advent of Raper gilling, pressure drafting and A.S.D. spinning, the reduced drawing process will lend itself to this technique of drafting since we shall have fewer slubbing weights to handle and it will therefore be possible to make the few flanges we shall require. And so we can see the evolution of a Universal set, for, as you know, the new Continental set which was shown at Milan consisted of Raper Gill, Bi-coiler, which in essence is the Raper pressure drafter, the Ambler draft finisher followed by Ambler super draft spinning. This scheme is very similar to the present new Bradford process, the only difference being the substitution of a drawing box by the Ambler draft unit. And so providing we can get the Continental people to accept tops with 1½% of oil, which isn't much more than their present figure, we have in essence arrived at the Universal set. Of course, such a short set raises the question of adequate mixing and doubling. The sets referred to have about some 48 - 64 doublings between Raper gill and the spun yarn.

There is, however, another point and this concerns the speed of drafting of the Raper P/D box which is presumably limited by the cone pulley drive, since too great a speed will cause hunting to take place. And so we now have to decide, if we want high speed drawing, whether we retain the pressure drafting unit in its present form or retain the drafting part (flume) and dispense with the Auto-leveller device or introduce flanged roller drafting as demonstrated by the Ambler draft unit and then, because we have done away with Auto-levellers, introduce one other unit into the set to increase our doublings as a compensating device. The scheme would then be as given in the table below

New Bradford Drawing

	Ends	Draft	Weight drams 40 yds.
Top	—	—	272
Raper Gill	16	6	720
Raper P/D	1	8	90
Finisher drawing ..	3	6	45
A.S.D. Spinning ..	1	99	1/40's

Suggested Drawing

	Ends	Draft	Weight drams 40 yds.
Top	—	—	272
Raper A/L	16	6	720
Ambler draft	1	4	180
Ambler draft	4	8	90
Ambler draft	4	8	45
A.S.D. Spinning ..	1	99	1/40's

Delivery from the first three operations would be into cans in twistless sliver and from the last Ambler draft unit on to bobbins for spinning. This scheme would supply 256 doublings instead of the present 48 in the new Bradford set and the cost of the extra machines would, presumably, be no more than the present Raper P/D with the advantage of speed and large cans which would allow no piecenings and any waste could be re-gilled.

Uniformity

These new drawing systems raise several issues. For instance, how is the number of doublings related to the degree of mix? It has seemed to me that many more factors than mere number of doublings affect the uniform appearance in a yarn and we recently carried out a preliminary investigation into this subject. The aspects we considered were: contrast in colour such as black and white, yellow and purple, orange and red; the proportions in which these colours were mixed; the count to which they were spun; the quality of the wool whether merino or crossbred; the stage at which mixing is initiated, i.e. the overall draft given to the product between the initial doubling and the final yarn; the number of doublings; and finally the method of spinning i.e. whether conventional or A.S.D. And from visual assessment of knitted fabric we formed the opinion that the order of importance, so far as streakiness in the fabric was concerned was in the order I have given them i.e., the factor which affects streakiness most is the contrast in colour of the components being mixed and the least important is the system of spinning with number of doublings almost at the end of the list.

I think that we have to admit that the new abridged processes leave little room for error. They are more critical than the older long drawing processes and this will affect the type of supervision we employ. I think we shall have to recruit either a much more intelligent overlooker or set up quality control plants—perhaps both. I think we would all agree that the older overlookers of today are better than the younger ones. But surely this is only because these older men would, had they had the opportunities of today, have been creamed-off to the grammar schools and might not then have entered the industry at all. I would like to see overlookers with G.C.E. passes in conscientiousness, observation, logic, games, mathematics and English. I doubt whether the first four subjects are in the present G.C.E. syllabus, but we could do worse than incorporate them. The idea of boys with good grammar school records entering the overlooking community will, I think, have to come if we are to carry over into the industry the benefits of invention, automation and modern engineering. And, of course, the pay and status will have to be commensurate with the ability of the personnel.

The last reference to automation prompts me to say that we can't assume that an automatic device is working properly just because the red light doesn't flash on. It will be necessary if we incorporate such devices to check all points regularly and systematically from time to time.

One aspect of man-made fibres which is going to affect the conventional worsted industry concerns the increased use of bulked yarns made from continuous filament and used in the hosiery trade. Here I feel wool will lose ground in competition with the synthetic fibres. Admittedly, the bulked yarns such as Banlon have provided the hosiery manufacturer with technical problems because of contraction after knitting and the need for a stabilising process, but the advent of Crimplene, which is a newer bulked yarn of high stability, very little shrinkage and non-torque, may increase the use of these fibres in this field.

Whilst it is conceded by the man-made fibre manufacturers that these materials soil more readily than wool, I think a fibre which will not pill, as indeed continuous filament fibres cannot, and will stand up to repeated washings without detriment to the fabric, will stand a good chance of success. Further, I feel that the younger generation is not so concerned with handle as we who have been brought up in a woolly world. I think bulk and colour are far more important to them than a woolly handle. And I do not think the spinner who produces staple fibre yarns for the weaver can be complacent in the light of the developments in knitting machinery.

We require two new types in our industry. The first is for senior supervision and technical management to be trained much more in basic engineering in order that they can appreciate and take advantage of any development. I think your technical management should travel much more than it does. I think discussion groups should be encouraged for technical topics. I appreciate that the Wool Employers' Council through their Recruitment, Education and Training Centre have done a great deal from the management angle but I feel we want more technical discussions too. And finally, we need inventors.

Reference

(1) Barritt, J., Wool Research, vol. 6, p. 233.

Lower U.K. Wool Stocks

U.K. wool stocks at November 30 are estimated by the Wool Industry Bureau of Statistics at 223·7 million lb. (clean weight), a reduction of 7·8 million lb. compared with a month earlier, due to a seasonal decline in stocks of non-merino qualities. Compared with a year ago, the November stock showed a reduction of 33·2 million lb. (clean), partly due to a reduction during that period of 18 million lb. in the U.K. government imported wool stockpile.

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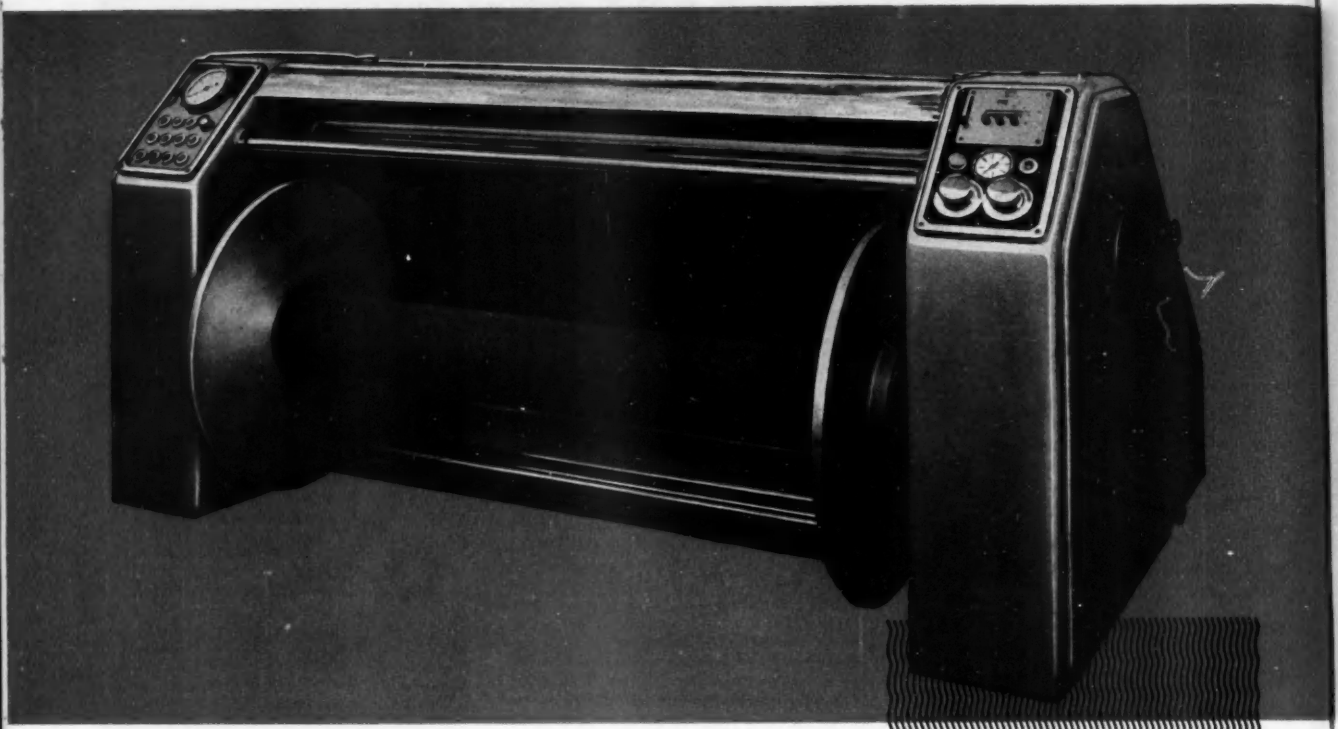

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Textile Oils*

Points dealt with in this paper included combing oils, oils for worsted spinning, cotton spinning and the woollen industry, also oils having a high content of free fatty acids and oils with pronounced detergent power

By R. H. H. MORLEY, M.A., B.SC., (OXON)†

THERE is no standard practice in applying worsted carding oil. In some mills it is sprayed or dropped on to the wet scoured wool just before it enters the dryer; in others, it is sprayed on after it has passed through a dryer and immediately before it is carded. At some mills the oil used is applied neat, but at others it is first made into an oil/water emulsion before being applied to the scoured wool.

In the U.K. some users of an oil assistant for carding prefer a W.I.R.A. certificated Class A combing oil such as Slivsol or Topsol for the purpose. Others prefer oils specially manufactured for worsted carding. As a rule these latter are of low viscosity, will emulsify readily on stirring with water to give stable white emulsions at 1/1, 1/2, and 1/3 O/W dilutions, and have a sufficient content of an anti-static agent in them as will minimise the production of "fly" due to static during carding when the oil is applied to the extent of 0·25%—0·50% to the scoured wool.

Essential requirements in a carding oil are:—

(1) Easily and cheaply removed from the slivers by conventional backwashing procedure.
(2) Conform to Fire Offices Committee insurance stipulations.
(3) Non-toxic, non-injurious to card clothing, and non-corrosive to iron, steel and other metals.

After carding the slivers—when intended for oil combing—are generally subjected to backwashing to remove dust and dirt from the wool, and most of the carding oil when one has been applied. The slivers are then dried and the addition of combing oil takes place at a gill box attached to the back end of the backwash dryer. About 3% of combing oil is applied at any rate enough to bring the total oil and grease content up to the permitted Bradford Conditioning House tolerance of 3¼% gross loss after absolute scouring.

Combing Oils

In the U.K. due to the horizontal organisation of the worsted industry as well as the system under which spinners buy their raw material, i.e., tops, pressures always exist to ensure that oiled Noble combed tops, for a given wool quality, are uniform in their properties. The behaviour of combing oil on the tops determines whether:—

(1) They lose brightness on storage and turn yellow.
(2) They become sticky on storage.
(3) They will spin well no matter how long they have been stored.
(4) Yarns and cloths made from them, carrying the oil, will scour easily no matter how long the time between production of the tops and the scouring.

These pressures also limit in practice the freedom of a topmaker or commission comber to use whichever kind of oil he likes for combing the wool. In fact the pressures are so strong that in practice the U.K. worsted industry standardises for oil combing on just one type and this has in practice to be a W.I.R.A. certificated Class A one.

Before 1939 the standard combing oil in the U.K. was olive oil. It was imported from Spain and other countries and sold without benefit of further processing to the combers. The ideal wool combing oil must possess the following properties:—

(1) Pale in colour and with little or no odour; if it has an odour it must be pleasant.
(2) It must be very stable chemically, including when exposed in thin film to the atmosphere for long periods, so that it behaves satisfactorily in the Mackey oxidation test. It must not develop objectionable odour or dim the brightness of tops and yarns.
(3) It must be readily removable by light scouring with dilute aqueous solutions of soap or detergents no matter how long it has been on the wool.
(4) It must be more or less neutral in reaction, be a free flowing homogeneous oil at average atmospheric temperatures, have a high open flash point (preferably above 420°F), and a Redwood I viscosity at 70°F in the range 320/370 secs. It must comply with F.O.C. insurance regulations.
(5) It must be a good lubricant to promote efficient combing and spinning, and also have satisfactory adhesive properties to help drafting and spinning. In other words, it should be practicable for a worsted spinner to spin the tops carrying it to very fine limits, e.g., to 1/60's or over.

No natural oils meet all these needs. Some qualities of olive oil nearly do and although for many years prior to 1939 olive oil was the standard combing oil in the U.K. it was never really satisfactory for reasons which include:—

(1) Due to its content of linoleates it does thicken up when exposed, as it is when on tops, in thin films to the atmosphere for periods of time. As time passes such films are converted into gummy materials, sometimes of a sticky nature, which no longer possess lubricating properties but instead are tacky. These "gums" when present in quantity, prevent efficient drawing and spinning of the affected tops, and when present on worsted yarns and cloths make scouring difficult and the results unreliable. For example, areas of such "gums" left on a worsted cloth after the scouring process resist dyeing and show as light patches or streaks on a piece dyed cloth.
(2) The quality of the olive oils was not uniform and standard. Primarily this was because the importance of adhering to certain critical technical specifications was not known, and as far as vendors and buyers were concerned olive oil was olive oil and invariable. In point of fact, some olive oils have a much higher content of glyceryl linoleates than others (the naturally occuring range is from 7·5% to 15·0% linoleic acid content) and thicken up and form gums when exposed to the atmosphere through oxidation and polymerisation both more rapidly and to a much more marked degree.

Clearly these variations of composition and behaviour in genuine olive oils could be expected to lead to many serious difficulties for a worsted industry dependent on tops combed with olive oil, and indeed such serious difficulties were standard to worsted production processes. The form they took included:—

(1) Difficulties in re-combing after slubbing dyeing, and in spinning the dyed slubbings "in the oil". The main difficulty in re-combing and spinning was that the olive oil, in many dyeing procedures, oxidised or polymerised and formed sticky "gums" that interfered with recombing or, due to the properties of the dyestuff or mordant, did so rapidly when the oiled dyed slubbings were in store so that the tops could not be drafted and spun.
(2) Olive oiled tops as a class had unpredictable drawing and spinning properties. This was because (*a*) the oil itself had far from uniform properties from delivery to delivery. and (*b*) the age of the oiled tops in every case had a marked effect on the drawing and spinning properties. Older the tops and greater the likelihood of their being difficult to draw and spin efficiently due to stickiness.
(3) Difficulties in obtaining uniform and satisfactory results from the scouring of worsted yarns and pieces. A normally satisfactory scouring routine

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* *From a paper given recently to Shipley Textile Society.*

† *Munmor Oils and Chemicals Ltd., Altrincham.*

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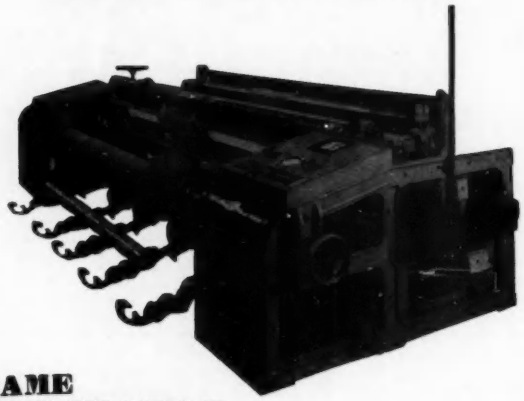

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would be found to fail to remove "gums", existing on the yarns or pieces, which had been made by oxidation and polymerisation of the olive oil. The failure could arise, for example, from (*a*) an oxidation and polymerisation prone grade of olive oil having been used by the comber resulting in "gum" formation by the time the scouring was being done, or (*b*) the oiled tops utilised having been in store for an abnormally long time, or the yarns "in the oil", or the cloth "in the grease", assuming a normally satisfactory grade of olive oil had been used originally in the combing of the tops;

Partly because of these difficulties the U.K. worsted industry in the period 1935/40 sought to establish standards of suitability for its intended use for all combing oils on the market, and to arrive at some alternatives for olive oil which could be used satisfactorily should olive oil become unobtainable. The practical results were:—

(1) The drawing up, under the auspices of the Wool Textile Delegation and W.I.R.A. of minimum standards of performance for combing oils.

(2) The certificating arrangement for combing oils under which oils offered on the market for combing can be described by their vendors as Class A combing oils only if they have been subjected to careful tests by the W.I.R.A. and subsequently certified by them as meeting all the highest standards of performance required from a combing oil.

(3) A permanent recommendation to combers by the Wool Textile Delegation that they utilise only combing oils which have been classified after test by the W.I.R.A. as up to Class A combing oil standards.

(4) The classifying of some novel oils, that is not olive oil, as Class A combing oils.

This work soon had important practical application, for with the outbreak of war in 1939 olive oil became unobtainable and so the whole of oil combing in the U.K. was for a period of several years standardised upon a Class A Combing oil based on groundnut oil and sold under the name "Control Combing Oil"; and for a short period immediately following, on BM oil, which was in effect "control combing oil" diluted with a refined mineral oil.

In 1949 olive oil was still unobtainable, and groundnut oil became unobtainable but the non-edible oils sperm and castor were in good supply and the worsted industry therefore used as combing oil the only W.I.R.A. certificated class A one which could at the time be manufactured and made available. This was Topsol which had been developed by Price's (Bromborough) Ltd. and which utilises among other materials sperm and castor oils for its manufacture.

This combing oil for certain commercial reasons was sold as "Class A (1949) Combing Oil" and not as "Topsol" for some years from 1949, but reverted to its proprietary name when Munmor Oils and Chemicals were granted a Class A certificate for "Slivsol" by the W.I.R.A. after the Association had carried out full scale and thorough tests on that combing oil. Slivsol, like Topsol, requires for its manufacture, as well as other materials, sperm and castor oils and these two combing oils are identical for all practical purposes.

In the U.K. an additional safeguard is provided by the manufacturer of the combing oil giving an undertaking to the Wool Textile Delegation that he will only sell combing oil which, after he has made it, he has *true sampled* to the W.I.R.A. and which sample W.I.R.A. have tested and approved as up to Class A combing oil standard. The combing oil manufacturer also grants W.I.R.A. the right, for the strict operation of the W.T.D./W.I.R.A. standards control arrangements for combing oils, to send representatives to his works and take samples.

The sperm/castor type of combing oil is a manufactured oil, made to rigorous specifications, and because of this its technical properties as a combing oil are substantially invariable. This fact, the strict quality control maintained by the W.T.D./W.I.R.A. arrangements for certificating and maintaining the quality of the oil as marketed, and the excellent resistance to oxidation and polymerisation of this class of combing oil have resulted in practice in the elimination of the difficulties which plagued users of olive oil combed tops.

Outside the U.K. there is comparatively little oil combing of wool. The combing oils used vary a great deal from country to country. In Japan, the little oil combing done is apparently carried out with the application of camellia oil. In Australia much oil combing is done with the use of blended combing oils containing mineral oil.

Oils for Worsted Spinning

Worsted spinners in the U.K. commonly utilise "spinning creams". These are aqueous emulsions of a Class A combing oil containing the emulsifier (which is often fatty soap), an antistatic agent, and sometimes silica sol. The latter when present is intended to increase "drag" during drawing and spinning. These spinning creams frequently contain 70% of water and are applied by the spinner to the tops to the extent of 1½% by weight.

There is a tendency for worsted spinning creams consisting of emulsified oils to be replaced by blends of non-ionic detergents of the polyoxyethylene ether of alkyl phenols and long chain fatty alcohol types. Such non-ionic detergent blends have pronounced antistatic properties, are soluble in water, have useful properties as spinning assistants, and when they are present promote the scouring of yarns and cloths. They are especially useful, due to their last mentioned quality, as spinning assistants for mixed wool/"Terylene" tops—for when they are not so added to mixtures of these fibres the subsequent scouring of yarns and cloths—made therefrom free from combing oil—is difficult and so expensive. These blends of non-ionic substances are added, to the extent of about 1% weight, in drawing.

Ambler Superdraft spinning to be efficient with oil combed tops needs, I understand, the application to the sliver of about 2% of an antistatic solution which is often made up of 30 parts of Lissapol N, 2 parts of sodium benzoate and 68 parts of water by weight.

Cotton Spinning

In the opening department there used to be so much dust and fly that workers therein frequently developed byssinosis, a disease of the chest. In the last five years it has almost become standard practice in the U.K. to oil the cotton using pneumatic dust extractors with 0·25 to 0·50% of a mineral oil emulsion to reduce dust and improve working conditions.

Woollen Industry

Woollen blends are always oiled. The total content of oil and grease on the oiled blends is normally between 8% and 10%. The word "grease" refers to wool grease present in the blend on the wool utilised. The purpose of the oil is to help carding and spinning for in woollen spinning the adhesive as well as the lubricating properties of the wool oil used are necessary.

In the U.K. woollen industry the wool oil also has another very important purpose Almost invariably it is a strong detergent, or capable of becoming one by the action of soda ash on it. Therefore, in the later scouring process which must be applied to either the yarns, or to cloths, on the working of these in water or in dilute aqueous solutions of soda ash the wool oil acts as a detergent and not only removes itself from the fibres but also removes all dirt, the loose dyestuffs when present, and also helps to consolidate cloths.

In some parts of the world triglyceride fatty oils, and mixtures of them with mineral oils, are used as wool oils. These are excellent for blending, carding, and spinning but have no detergent power, and the scouring of the woollen yarns and cloths made by their use requires the use of substantial amounts of fatty soaps or other detergents which procedure is expensive by comparison with water or aqueous soda ash scouring.

Oils Having a High Content of Free Fatty Acids

They are commonly marketed as 50's, 70's and 95/98's oleines. The number represents the total percentage of saponifiable fatty material present in them. The remainder of the oil is neutral and unsaponifiable and commonly is a petroleum lubricating type oil having a flashpoint about 380°F. The saponifiable matter consists for the most part of high molecular weight fatty acids, usually derived from tallows and vegetable oils and by distilling recovered wool grease, which form soaps having pronounced lathering and detergent power when reacted with dilute soda ash solutions during yarn and cloth scouring.

Substantially Neutral Oils Having Pronounced Detergent Power

These are highly efficient for woollen carding and spinning, scour themselves, and really clean the yarns and cloths which are carrying them as soon as such yarns and cloths are scoured in aqueous liquors. These oils do not require that soda or other alkali shall be present to saponify them to make the active detergent (as the oleines do). The active detergent is present already in these oils and exercises its effects as soon as they are wetted with water. Very effective scouring of yarns and cloths in neutral liquors and mildly acid ones is obtainable, as well as in mildly alkaline liquors. Some of these oils when used to card and spin clean blends

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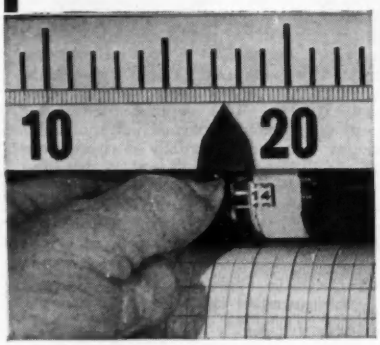

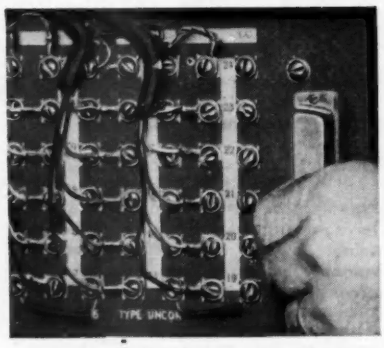

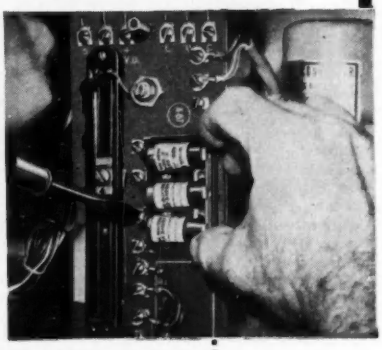

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will scour satisfactorily from the yarn in a dye beck, so allowing the elimination of separate scouring.

These neutral oils have the additional virtues that they are quite non-oxidising, have a low flame propagation rate, and altogether are much safer to use in a woollen mill than most of the oleines on the market. Also they have strong anti-static properties and these make them excellent for carding lively blends; because their viscosities can also be adjusted over a wide range without interfering with their other properties, by a judicious selection of oil the woollen carder can achieve efficiencies and output greater than is practicable with the oleine class of oil.

These neutral oils do not react with lime and by using them woollen manufacturers who use a lot of "limey" wools secure many advantages. Invariably these oils contain a substantial amount of mineral lube oil and non-ionic detergent. The annual tonnage sold of them to the U.K. wool spinning industry is increasing and already is substantial at probably 750/1,000 tons.

Miscellaneous Wool Oils

These include:—

(1) blends of neutral triglyceride fatty oils, fatty acids, and mineral lube oil;
(2) blends of wool grease and mineral oil; and
(3) oleines to which non-ionic emulsifiers have been added to enhance their antistatic properties and/or to make them self-emulsifiable with water.

Rag Pulling

The well established and ancient trade of recovering wool from rags for re-use by the woollen industry utilises textile oils. The rags which are to be torn and opened to make shoddy are oiled to the extent of 10/15% of their weight with an oil of the kind described for wool spinning. The oil, of course, lubricates the fibres, minimises friction, and reduces fibre breakage on pulling machines.

Flock Manufacture

Woollen rags after being washed are oiled with an aqueous emulsion of a "flock oil." This is sometimes done before the washed rags have been dried, and sometimes after. The amount of oil added is small, only about 1¼% maximum. Flock oils need to have specialised properties, and are specially compounded for the user. The scoured rags after the oiling, substantially dry, are in effect "pulled" on specially designed flock making machines.

Synthetic Fibres

The number of different synthetic textile fibres in the world is large and grows. Many in the form they are sold by the manufacturers carry a small amount (of the order of 0·25% or less) of textile oil which has been applied to improve their handle and/or to help the textile industry, for example, to open, card, and spin them. The "textile oil" in such instances is often referred to as a "finish" or as a "softening agent", and is often formulated to possess strong anti-static properties.

New Machinery and Production Costs

SOME pertinent questions relating to the effect of new machinery on production costs were considered by Mr. K. P. Norris, (Shirley Institute) in a recent talk to the Bolton section of the Textile Institute. For example, how worthwhile was three shift working? What should be the relationship between capital cost and operating cost to give economic working? How important were ancillary costs, such as electric power? Was bobbin size a critical factor in relation to a given count of yarn? In answer to the first question, Mr. Norris offered a view that whilst the overall reduction in spinning costs from two-shift working was substantial and well established, the further reduction that a third shift brought was less pronounced and could, in cases where special problems of staffing or supervision existed, become hardly worthwhile.

On the second question Mr. Norris gave estimates of the principle costs at the ringframe of 20s. and 50s. yarns and showed that even on the modest basis of depreciation over twenty years the capital charges on new ringframes were as large as the total wage bill for single shifts. even for a modern mill with full re-deployment and low OHP. In such a case multiple shift working led to a reduction in the total cost of spinning even though labour cost was substantially increased, and the depreciation period shortened to fifteen years for two shifts and ten years for three shifts. On the third point Mr. Norris pointed out that electric power was more important in spinning than was sometimes realised and the reductions in power cost which resulted from the maximum demand tariff helped to offset the cost of multiple shift working.

The choice of bobbin size for new ringframes was a matter which merited careful attention. The advantages which larger bobbins gave in doffing and winding costs had to be balanced against higher capital costs per spindle and greatly increased power consumption, e.g., for 30s. yarn spinning at 9,000 r.p.m., a 10 × 3 in. frame took four times as much power as a 7 × 1¾ in. frame. Since the savings were related to weight produced, while the additional costs were related to spindles and spindle hours, larger bobbins were more advantageous for coarse counts, because of the higher rate of production.

In calculating which size of bobbin gave the lowest total cost for a given count, the assumptions most favourable to the larger bobbins would be that the spindle speeds would not be reduced for the larger bobbins, that the end breakage rate would not be increased, and that the spinning firm would reap the full benefit of the saving in winding. Calculations made on this basis for double shifts showed that for a given count there were usually several bobbin sizes which differed little in total cost, but that the scope for large bobbins was limited to the coarser counts. In present conditions, 3 in. rings were not economical at 16s, 2½ in. rings were not economical at 20s, and for 40s. and above the economical sizes differed little from those generally used in the past. A firm might anticipate rises in labour costs relative to power costs, and select a bobbin size rather larger than was economical at present, but on the other hand it must be remembered that the assumptions made were favourable to large bobbins and that if, for example, automatic winding was introduced, the saving in creeling costs would be considerably less.

Comparing estimated labour costs at the ringframe and speedframe for 20s. and 50s. yarns spun under modern conditions, with high drafting and single speedframe process, with like yarns spun under conditions typical of a mill using old machinery, Mr. Norris showed that on a single shift basis, the savings were smaller than the annual charges, calculated on a 20 year basis, for new ringframes. From this he concluded that re-equipment could only be justified if new machinery was worked on at least a double-shift basis. Admitting that on single shifts larger savings could be shown in coarse counts (e.g. 12s.) Mr. Norris contended that nevertheless the general thesis remained true, more especially if taken in conjunction with the possibility of the poorer quality of yarn from existing machinery and the present chronic shortage of labour.

Looking to the future, Mr. Norris thought the current contention that machinery should be replaced more frequently, say every ten years, seemed unlikely to apply in the case of ringframes. At present, to justify replacement of a modern ringframe on the basis of savings in operating costs, almost the whole of the spinners, doffers, and speedframe tenters would have to be eliminated. Changes in the relative costs of machines and labour would increase the potential savings, but this was a gradual process, and therefore it was probable that, unless there was a radical departure from the present technique of spinning, the ringframes being installed today would be in use for considerably longer than 10 years.

U.K. Carpet Exports

Exports by the U.K. of traditional Axminster and Wilton carpets in 1960 realised £9,723,000—£3 million more than in 1959 and the highest total since 1956. The Federation of British Carpet Manufacturers says that major markets for U.K. carpets in 1960 were Australia (£4·9 million), Canada (£1·3 million), Western Germany (£565,000), New Zealand (£495,000) and South Africa (£427,000). All other markets totalled £2 million.

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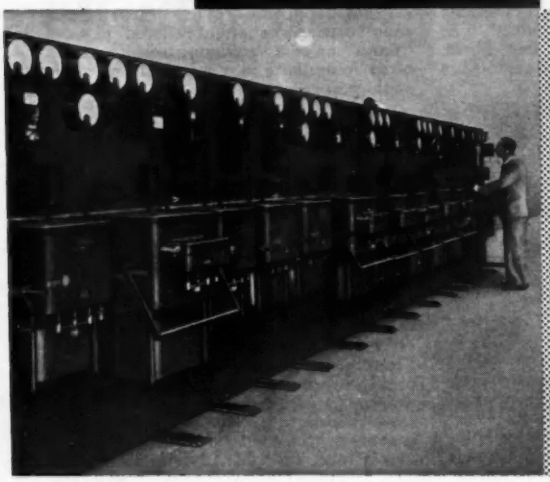

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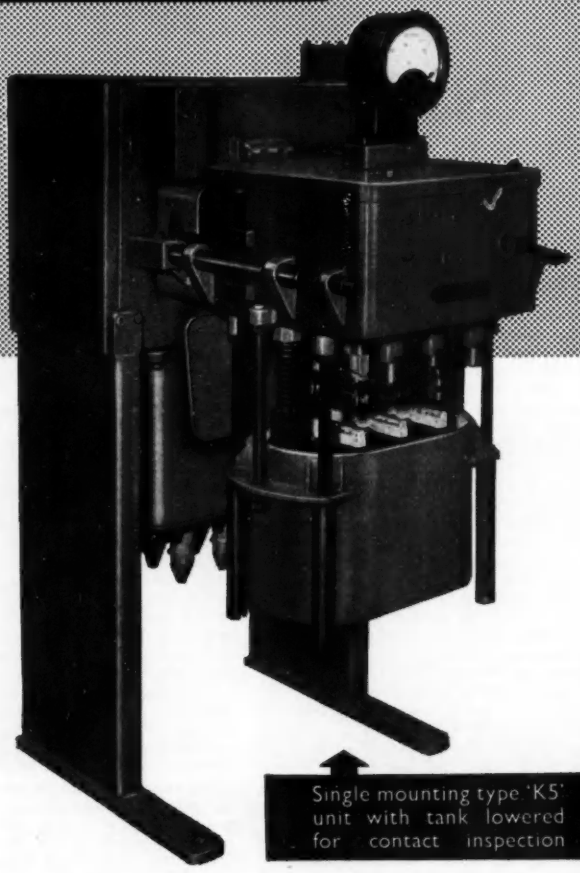

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Quality Control

By H. MARSLAND†

THE Lancashire textile industry must produce goods of exact standards and qualities, suited to the needs of its world-wide customers, if it is to meet the contraction challenge posed by the redundancy schemes. And the weapons with which to fight are greater productivity, closer contact between producers and customers, and, above all, *quality* control coupled with modifications to operatives' bonus payments. If ever there was an industry where operator-responsibility for quality is important, this is it. How remarkable it is that in 1961 there are in general operation no bonus payments which depend on quality as well as quantity considerations.

It is vital that some persons, firms or groups take the lead and shoulder the responsibility for the production and distribution of products of exactly the type and standard required for ultimate users whose needs they fully appreciate. They must make sure that the user gets what he requires to do his job cheaper and more efficiently. The consumer who gets this level of service will be glad to pay a reasonable price for it and, what is more important, he will come back again.

Some new and improved form of industry structure is needed to establish this new basis of operating. Increased vertical-isation, through amalgamation or mutual agreement, seems to be required between firms or groups in different sections of the Industry. Somebody must take the lead, only the future will show whether these leaders and their groups will emerge.

During the past twenty years Associated Industrial Consultants Ltd. has been privileged to co-operate with 400 textile concerns in most sections of the Industry. In that time fundamental changes have taken place and more must follow as a result of the Redundancy schemes, from which it is already clear that labour forces and plant in every section of the Industry are to be very much smaller.

Plant and Resources

It is doubtful whether the full effects of these changes are yet fully appreciated. As yet orders seem to be relatively easy to obtain and, judging by the year-end figures, the margins would seem to be none too bad. Workpeople are as much in demand as ever before but the real competitive pressures have not yet appeared. Never was there a moment when still greater productivity was needed; never was there greater need for the better utilisation of available plant and resources.

The labour force is showing co-operation and a responsible approach to the new conditions. Revised staffing of machines, evening shifts, night shifts,—all these things seem now to be acceptable. It is away from the shop floor that the storm clouds are more likely to gather. What is to happen, with reduced productive capacity, if the traditional peaks and troughs of demand cannot be eliminated, or at least made less severe? A difficult problem indeed, yet how heartening that some of the papers at the recent Cotton Board conference got right down to this problem at this early stage.

Peaks and troughs recur in many industries. Why, then, is the effect always so much more serious in the textile industry? It cannot only be because the Industry is horizontally integrated. Other horizontally integrated industries never seem to be affected to the same degree. Let us take a closer look. What are the basic differences between the structure and procedures of our textile industry and those industries less susceptible to the effects of demand fluctuation?

One fundamental difference is that many of the producers in the early stages of our industry are more remote from the ultimate consumer. Often they do not know who the customer is, where he is, or for what purpose he will be using the yarns or cloths they are making for him. Where some rough knowledge of these things does exist, the producer will no doubt use this knowledge to try to provide the quality features that are likely to be wanted. But he really cannot do so much. No adequate machinery is available to communicate in the precise turns required the exact specification of the customers' needs; no universally accepted definitions and standards have yet been developed to the level that is required.

Yarn Standards

American yarn in 24s. counts can be many different things. Yarns of different tensile strengths, regular or irregular, white or not so white, bright or dull, with one slub or fault per yard or per mile—all these can be 24's American provided they are made of cotton and have something between 23½ or 24½ leas/lb. The weaving may be good or bad. Who can say the products are not up to standard? Who can say what the standard is?

In all the diversity of textile products, different quality features are to be desired to fulfill different end-uses. In some cases, it may be appearance and handle; in others, appearance and handle may be unimportant, but strength the essential. In nearly all textile processes the incidence of imperfections can be drastically reduced. This reduction almost always costs money. The maintenance of certain quality features makes demands on the time of the operative and often reduces the utilisation of plant. Not in all cases will extra effort be worthwhile, nor will all ultimate users require the quality feature that is achieved through painstaking care. If the customer who pays does not require that bit extra, should he have to pay for it? On the other hand, if special quality features are required by the user and he can be certain of obtaining the required features, he will pay for them gladly.

The suggestion that all the necessary requirements are already being provided by existing arrangements is fallacious. Let us take only one example,—though many others could be quoted. Let us take the question of "cleaning" or "wiping down" on the frames. All would agree that cleaning is a most important operation in the maintenance of yarn quality. If you ask many a head carder, however, he will tell you in precise terms how many times this or that routine must be completed each cycle or at doffing times. At times, the cleaning routine—claimed to be responsible for the quality on which the firm's reputation has been built—has never been carried out. Sometimes there are not enough people in the room to do the whole suggested routine, not even if everyone spent all their time on cleaning.

Such experiences still do not invalidate the statement that cleaning is important. The things yet to be settled are which method should be used and how much cleaning must be done to produce that something so much better than the customer wants to pay extra for it. This is no small consideration when it is realised that in some Mills as much as a quarter of the wage bill is spent on cleaning routines.

What, then, is the answer to this problem of quality control? Quality specifications in precise terms are needed to indicate clearly the quality features and degree of them existing in the yarns and cloths offered for sale. Simple codes could be devised to qualify yarns and cloths. Just what should be covered in these code specifications is a matter for much detailed technical and commercial research, probably coupled with a great deal of market analysis.

It is, of course, true that many of the items are difficult to measure and control during production. In fact, every reader who is in the trade can probably think up circumstances where attainment of the types of accurate measurement now suggested is well nigh impossible. Nevertheless, speaking generally, great scope does now exist for quality improvement and control. Efficient new measuring and testing devices are available, though little real progress has been made in their use.

Because the achievement and maintenance of quality features will inevitably demand operatives' time during manufacture, modifications of bonus payments should be considered to include quality as well as quantity awards. Do I hear cotton men saying that these things can never be done? Will they consider then what is *being* done with enormous success in their industry by one of Britain's leading chain stores?

Without the refinements now suggested, a great impact has been made in recent years and this firm has provided, for an important section of the popular home market, just what the public wants. An extension of these principles could provide just the shot in the arm our export trade needs and could add fresh lustre to the proud tag "Made in Lancashire."

Investment in Sudan Agriculture

The Agricultural Bank of the Sudan is reported from Khartoum by Barclays Bank D.C.O. to have earmarked £6 million to finance various agricultural schemes during the coming season. These schemes include cotton cultivation in the Blue and White Niles.

† *N.W. Regional Director, Associated Industrial Consultants Ltd.*

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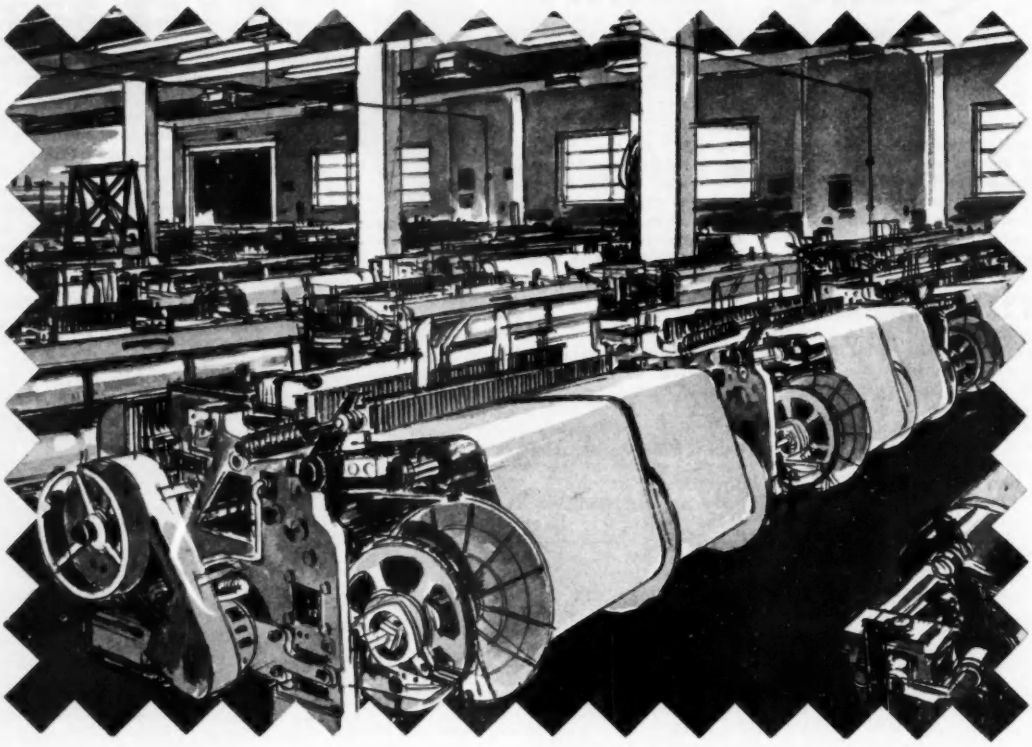

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Textile Trade and Prospects

Cotton Yarns and Cloths

Recent statistics released by the U.S. Dept. of Agriculture show that the 1960 cotton crop was down about 200,000 bales from a year earlier and disappearance in 1960-61 is expected to exceed production. The carryover on August 1, 1961, therefore, will probably be about 200,000 bales less than a year earlier. Disappearance during 1960-61 is estimated at about 14·7 million bales which compares with 16·2 million in 1959-60 and includes declines in both domestic mill consumption and exports. Although exports may fall below the very high level of 7·2 million bales of 1959-60 they are still expected to be relatively large. At about 6·5 million they would compare favourably with the preceding 4-year average of 5·8 million and would be higher than during any season from the end of the last war to 1956-57. High level exports are being maintained for the following reasons (*a*) relatively high consumption of cotton in the free world (*b*) larger exports from the free world to the Communist countries because of smaller crops behind the Iron Curtain (*c*) an increase in free world stocks during the current season and (*d*) larger U.S. government financing of U.S. cotton exports. Mill consumption of cotton in America during 1960-61 will probably be in the region of 8·25 million bales in contrast to 9 million in 1959-60. Indications of this decline are (*a*) steady increases in the stock-unfilled order ratio for cotton broadwoven goods for several months (*b*) decreases in prices for fabrics (*c*) large imports of cotton textiles and (*d*) lower rates of mill consumption of cotton. Imports of cotton textiles during 1960 continued at a record high level—an annual rate of around 555,000 bales for 1960. For the first time, imports of such textiles were higher than exports which were at an annual rate of about 493,000 bales in the first 10 months of 1960. During December, the average 14 spot market price for Middling 1 in. was 30·16 cents/lb., which was very close to the minimum sales level of local agents and compared with 31·78 cents in 1959. In December the minimum sales price for Middling 1 in. by local sales agents for C.C.C. at the 14 spot markets averaged about 30·11 cents/lb.

In Lancashire trading circles interest in yarn and cloth has been well maintained although the total turnover has probably been no more than in recent weeks. Some slight variations in raw material prices have created a little hesitancy in some quarters but it has not materially affected the demand for a wide range of counts and qualities. Medium count standard weaving qualities on ring beam, cop, cone and cheese have been well supported. Although delivery times have shortened appreciably, the delay to many buyers is still a worrying factor and the situation has not been helped by the absences through 'flu of large numbers of operatives in cardrooms, spinning rooms and weaving sheds. The off-take of mule-spun fine, combed qualities has been much better, in fact, present production does not seem to be able to keep pace with sales Doubling wefts and hosiery qualities are in good demand and in all cases the utmost urgency is expressed concerning delivery and less is heard about niggling complaints. Coarse counts, and condenser types have been extremely well booked and all varieties of blended yarns are in keen request and the interest in core yarns remains exceptionally high. Heavy doubled and cabled yarns are similarly well supported but in very few cases have the individual orders been for very large quantities.

In both spinning and weaving circles labour is only one worrying factor amongst other things. Labour turnover is undoubtedly a costly business, the situation being adversely affected by shift working and the lack of new entrants from the schools or other industries. During the month a fair amount of inquiry for a wide range of cloths has been dealt with. As with yarns the orders have tended to be smaller individually but in total are still very encouraging taking into account all the factors involved. Some lines of cloth are in extremely short supply but, on the whole, most dress fabrics in cotton, rayon and blends can be had in reasonable time whether they are dobby or jacquard designs or roller or screen printed types. Furnishing fabrics in new colour and weave combinations in traditional and contemporary styles are eagerly sought, and duplex printed cloth maintains its popularity in clean-cut, fresh colours. Retail sales of household textiles have had encouraging affects in wholesale and manufacturing circles, for new business has been distinctly better in quiltings, cotton blankets in pastel colours and pleasent check patterns. Trade has been similarly good in towellings and bath mats and most of the interest has centred about the medium and better quality goods.

Wool Consumption and Trade

U.K. wool stocks at 224·9 million lb. (clean weight) at December 31 last, were 1·2 million lb. higher than at the end of November and 35·2 million lb. lower than a year earlier, according to the Wool Industry Bureau of Statistics. Top stocks at December 31 were 65·5 million lb., some 0·3 million lb. lower than at November 30 and 8·3 million lb. less than at December, 1959. Despite 5% decrease compared with 1959, U.K. wool consumption in 1960 (489·5 million lb. clean) was the third highest in ten years and the fourth highest in the industry's post-war history, having been exceeded only in 1950, 1953 and 1959. U.K. wool and hair top production totalled 319·25 million lb., only eight per cent below the previous record output of 348 million lb. in 1959. Worsted yarn deliveries (244·8 million lb.) were the highest recorded. Woven wool fabric deliveries—367·1 million sq. yds.—were 2 million sq. yds. higher than in 1959.

"Britain remains the largest consumer of wool in the world", declared W. Trevor Hunter, the British Wool Federation's president-elect at Leeds University Textile Society's annual dinner. "Despite the glamour attached to Japanese wool buyers, who have surpassed Britain's purchases from Australia, Britain's total wool usage was twice that of Japan" he said. "There was no doubt that Britain's wool textile industry was flourishing. It now processed 30% more wool than 25 years ago, and was doing this with 20% fewer operatives—no mean achievement. A challenge to be met in the sixties was competition from the products of cheap labour in some rapidly developing countries."

Commenting on the fact that wool consumption in the U.K. last year reached the third highest total for ten years, the Wool Textile Delegation states that annual production and employment figures for the industry were "very satisfactory," bearing in mind the experience of other consumer goods industries and the severe difficulties—chiefly in the raw material section of the industry—which some wool textile firms themselves had to face.

"No one expected the industry to create new production records in 1960, for it followed the recovery year of 1959 when demand was unusually large on account of the re-stocking movement after the 1957-58 recession," says the Delegation. "Consequently, it is most gratifying to report throughout the industry figures which, taken as a whole, are equally as favourable as the previous year's. If the Korean war period is excluded, all the yearly figures of the wool textile industry since 1945 have been remarkable for their freedom from the extreme variations which have characterised a number of other consumer goods industries, particularly those associated with hire-purchase."

Sales of South African wool in the first half of the current season—up to December 31—realised £23-million, or about £5-million less than in the corresponding period in 1959. Because of the drought the total quantity of wool sold—147 million lb. — was nearly 9 million lb. less, while the average price fell from 43d. to 37d. a lb. In November the South African Wool Commission bought in less than 6% of the offerings but the weaker tone of the market in December "necessitated a fairly vigorous application of the commissions' reserve price scheme, entailing purchases of 18,344 bales or 17% of offerings." Total purchases by the commission during the first half of the season amounted to 78,000 bales, or 14% of offerings.

Linen Trade Report

With the end of year stocktaking over the usual January lull has provided opportunity to analyse the 1960 trading figures, and from these to deduce the possible trend of demand in 1961. This is extremely difficult in a market that is becoming increasingly competitive, and in which competition stems from such a

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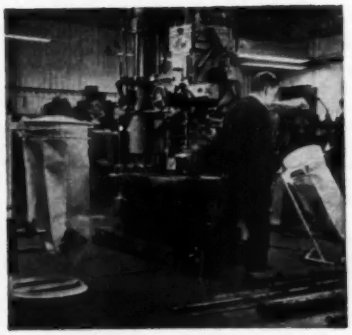

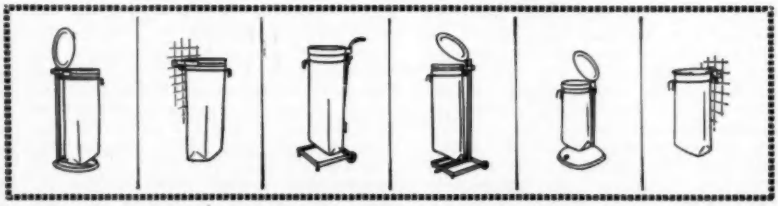

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variety of sources. Not only have British manufacturers to meet the challenge of their Continental rivals, who are more fortunately located in the vicinity of their raw material markets, the industry as a whole is waging a life and death struggle with its main competitors cotton and man made fibres in both home and export markets.

The result of the struggle to date is apparent in the list of casualties incurred, particularly in the N. Ireland wet spun section which, on present assessment, still possesses considerable redundant capacity. The reason for this and for the progressive decline in demand for British linen manufactures lies mainly in the price disparity with its competitors, including linen goods from other sources.

While the British linen industry has spent approximately £25 millions on re-equipment since the war it has not improved its competitive position materially in world markets. The production cost differential between linen and its competitors is too great to be bridged by adherence to traditional techniques. The need to bring linen manufacturing costs into line with those of its rivals demands a complete break with established practice and the evolution of new methods of manufacture which will permit short cut processing and the associated economies.

This line is being followed successfully by Continental linen manufacturers who, working in collaboration with flax growing interests, have evolved new techniques for producing and processing unretted fibre. These eliminate the costly retting and associated operations, employ a modified processing sequence, produce rove and yarn which give better performance on modern spinning and weaving equipment, and an end product comparable—and for some purposes superior—in quality and performance to that made from retted flax.

A notable development on these lines is reported from Holland, where it is stated that the N.V. Algemene Kunstzijde Unie, one of the major industrial concerns in the country and its largest rayon producer, is to establish a new mill to produce linen yarn from natural or unretted flax by a process evolved by T.N.O., the Dutch equivalent of D.I.S.R., and developed in conjunction with a body representative of flax growers and manufacturing interests.

Despite quiet conditions in the spinning section a firm demand exists for raw material and it is evident that some mills are still short of their off season cover. With stocks of retted straw now coming to an end scutchers are regulating fibre deliveries to maintain prices. The selection generally is poor, but current interest is mainly in the lower grades. Stocks of straw still to be retted will provide ample coverage for normal requirements until the 1961 crop is available, though the quality standard is not expected to be high, due to weather damage.

Narrowing profit margins in all linen products are responsible for increasing diversion to processing man made fibres, both alone and in blends. Considerable research is being carried out on the technical problems by manufacturers and machine makers, and a modified processing sequence is now available which is claimed to be more economic in performance and comparable in quality of output to those used in other sections of the industry.

Jute Yarns and Fabrics

Raw jute markets in Pakistan became much dearer at the end of January and E.P.C. values of long jute were raised £3 to £4 per ton; in the case of cuttings and rejections the increase was £8. Some Continental countries had been in the market and at the same time a fair amount of inter-baler business was taking place. Imports of loose jute from up-country in East Pakistan are small and cultivators are able to hold the remainder of their crop. As a result, the flow of fibre to baling centres will be regulated and at no time will stocks be allowed to accumulate. All consuming countries still have substantial quantities to purchase from the present crop and there is every indication that the position will become more difficult towards the end of the season. It is estimated that the quantity of jute still to be marketed for export overseas is between 1,000,000 and 1,200,000 bales which is less than the expected demand.

Although registered sales of raw jute to the U.K. this season are substantial, Dundee spinners still require to purchase further supplies to maintain production until fibre from the next crop becomes available. It is expected that Dundee spinners will reduce their stocks of raw material to as low a level as possible and only buy against current yarn sales. Spinners cannot afford to carry large stocks of jute at the end of the present season when prices are at such a high level.

The position on the Continent is somewhat different, as spinners there are not carrying large stocks and steady buying will have to take place during the remainder of the season. It is also reported that India will have to obtain further quantities of low grade raw material from Pakistan and this is already reflected in the very high prices being asked for cuttings and rejections.

The quality as well as the quantity of Pakistan jute is reported to be falling away and at the same time offers are not being freely made. Shippers are reserved and when sales are made they very often remain out of the market for some time. Offers are being made at £205 for Mill Firsts, at £198 for Mill Lightnings, at £194 for Mill Hearts and at £187 for grade Hearts, c.i.f., U.K., for Feb/Mar. shipment. Grade Tossa-2/3 is at £198 10s. grade Tossa-4 at £196 and Continental Tossa-2/3 at £193, for Feb./Mar. shipment. There are now very few holders of secured parcels willing to discount the market and it is felt that the recent cheaper sellers have disappeared from the market for the rest of this season. Offers of cuttings and rejections are scarce and prices generally about £14 per ton above E.P.C. levels. S.N.C. was named at £140 and N.C. at £133 for current shipment. The value of a S.M.R. is in the vicinity of £150 per ton.

The Calcutta goods market has also become very much dearer during the past month and prices of both hessians and sackings have touched the highest level for many years. A shortage of raw jute in India which has brought about reduced working hours caused prices to rise, then increased demand from North America forced values still higher. The Indian Government are trying to regulate production by controlling working hours to keep a check on prices and so far this has been fairly successful. Quotations are at 99/9 for 10 oz. 40 in., and at 74/9 for 7½ oz. per 100 yds. f.o.b. Calcutta for March shipment and at 98/9 and 73/9 April/June. B twills were quoted at 304/9 and 299/3 for the respective shipment periods.

A fair amount of demand for Dundee yarns and cloth was shown about the beginning of the year but since then the position has been much quieter. There are still some fair orders being placed but consumers are reluctant to carry too large stocks of manufactured goods at the present price levels. The present selling rates of Dundee yarns and cloth are low in comparison to the cost of raw material and this benefit is being passed on to consumers because Dundee spinners purchased fairly large quantities of raw material when prices were well under present levels. Although order books in Dundee do not go very far forward, the business being received is sufficient to maintain output at the present levels. The heavy end of the trade is also fairly quiet but further orders for sackings dan tarpaulins are being placed. Most descriptions of cloth can be obtained for reasonable early delivery.

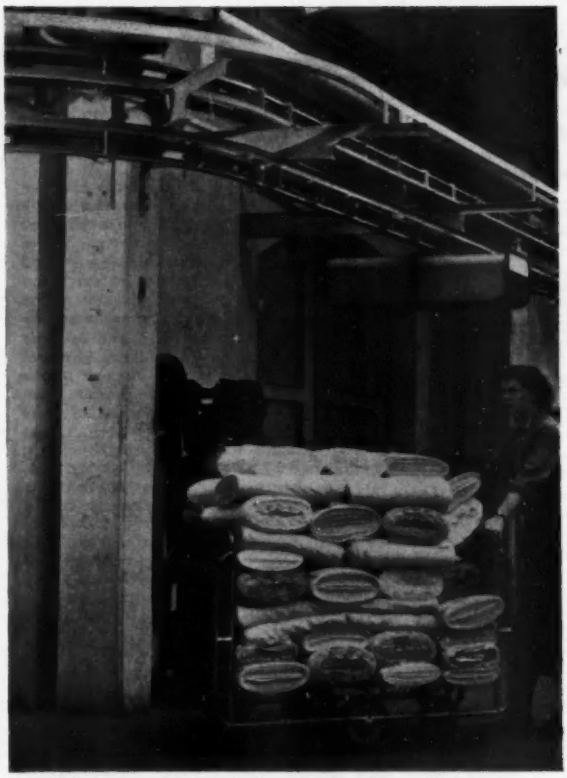
Silk and Man-Made Fibres

Activity during the past month has been pronounced in already advance buying for many months ahead. Delivery dates vary but for many spinners, especially in hosiery counts, two months is a fair average and yarn dyed deliveries are longer. The Lancashire trade has been brisk especially with the blends of man-made fibres and cotton. "Terylene"/cotton blends are still wanted for the shirting trade, also acetate/cotton and acetate for taffetas is in brisk demand.

The linings trade is busy with "Tricel" in good demand. On the Yorkshire side the woollen section is very active and for furnishings in blends of wool and newer fibres there is quite a steady demand. Worsted spinners report a good call for yarns destined for double jersey fabrics, and indeed, this demand shows signs of steady increase. "Terylene"/wool blends are well supported and there is a good outlet for "Courtelle". Yarn deliveries for the Midlands trade are in the region of nine weeks in many cases, but the position is a little easier in undyed yarns.

In Macclesfield and Leek throwsters report good business, probably due in part to the recent Nylon Fair. Interest in silk is still showing signs of developing further and probably the forthcoming Silk Congress in this country has something to do with this. Especially pleasing is the demand which is reputed to be forthcoming from teenagers who have never worn silk before. Interest in bulked yarns for knitted outerwear continues and shows a good increase on a year ago, as does textured yarns for both nylon and "Terylene".

The knitted underwear trade is tending to suffer due to the present fashion of teenage girls not wearing vests. On the other hand the fashion for chunky cardigans is assisting the synthetic fibre industry and a new development said to be looming up is the fashion for knitted collars and trimmings for woven garments. Several manufacturers working at pressure to supply wholesale and making-up trades who in turn fix these to woven garments. The result is an attractive blend of woven body and knitted collar or cuffs.



Teleflex conveyor installed in the Dutch textile factory of Hollands-Zwitserche Borduurfabriek Egger N.V. Almelo. The old method of transporting loads by trolley is also shown.

Conveyorisation
by Teleflex

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Notes and News

"Courtolon" at Nylon Fair

"Courtolon" has continued its rapid growth since last year's Fair and is now being widely employed in a variety of end-uses which a year ago were the subject of trials, or in the first stages of production. Knitwear for men, women and children is an ever-expanding market and the large "Courtolon" plant, with its recently increased capacity, is in a strong position to meet the growing demands of manufacturers. One of the exciting developments is printed "Courtolon" in knitwear. Especially important is its ability to take brilliant colours and the most delicate prints can be achieved because of the "clean" surface of "Courtolon" garments, particularly in the modified "X" yarns, which are free from the fuzziness present in staple fibres. Hawick, the traditional home of cashmere, has produced a range of knitwear using both plain and printed "Courtolon" X.10 and all the craftsmanship associated with Hawick has been employed in the production of these garments.

Woven stretch fabrics in "Courtolon" and worsted and 100% "Courtolon" knitted cloths are used for ski-pants, slinkers and casual slacks. The stretch allows for a snug, closer fit with greater comfort in wear and the big range of colours in "Courtolon" may be used for stripes and checks.

The model on the left shows a sweater by Rushnit in honeycomb stitch "Courtolon" with check "Courtolon" pants by Londonus. On the right, a sports outfit in tweedy "Courtolon" by Londonus.

"Easy-Care" Qualities for Wool Sweaters

A knitting technique developed by the Hosiery and Allied Trades Research Association combined with a new shrink-resist finish from the Wool Industries Research Association's laboratories in Leeds has provided knitted wool sweaters with wash-and-wear properties. The further development in the H.A.T.R.A. laboratories of preliminary work done there by P. J. Doyle (suggesting that the prime factor in the stability of plain knitted structures was the length of yarn knitted into a single loop) has led to the introduction of a device for attachment to knitting machines. This can control the length of yarn used in each loop under normal production conditions.

As part of an I.W.S.-sponsored project to produce "easy-care" wool garments, it was decided to apply these principles in the production of long-sleeved wool sweaters which could be processed against felting in washing by using the new W.I.R.A. shrink-resist finish. Tests with these garments in which they are dried without tension following normal washing are reported to have shown that it is now possible to produce wool knitwear which will withstand considerable washing without changing shape or size and without surface rubbing and pilling being apparent.

* * *

New Adhesive for Carpet Labels

A specially prepared low temperature heat adhesive for use on carpet labels is announced by P. P. Payne and Sons Ltd., Haydn Road, Nottingham. The labels are easily attached by pressing on with a thermostatically controlled iron, and the effective period of dwell is only for 4 or 5 secs. The new adhesive is said to be excellent for use on rough or difficult surfaces. Paynes employ teams of highly trained artists who will readily submit ideas for label designs and colour sketches, without obligation, for the carpet maker's approval.

Conveyor Companies Merge

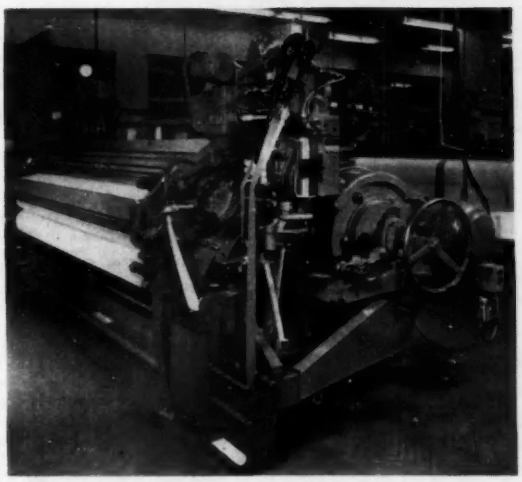
Conveyor Construction and Engineering Co. Ltd., Eastbourne has been incorporated in the Teleflex Group of companies. Whereas the well-known Teleflex overhead conveyors have a load rating of 100 lb. per carrier unit, C.C.C. conveyor's have been designed specifically for light industry and will carry up to 25 lb. per carrier, spaced at a minimum of 5 in. centres, increasing to a maximum of 20 in. in multiples of 2½ in. For certain applications 50 lb. can be handled by attaching the load carrying fixture to two coupled roller arm units at 5 in. centres.

The carrier units consist of a ball-bearing mounted roller which runs on the top of the pear-shaped track, which is solid drawn mild steel tube. From this roller is suspended the arm to which the actual conveying fixture is attached. On this arm is mounted a small flanged roller just below, and normally not in contact with the underside of the track. This is a steady roller which only comes into operation on corners and elevations. The carrier units are secured by clips to the case hardened driving chain, which meshes with the driving sprocket on the gear box. Bends in the horizontal plane from 5° to 180° are possible by virtue of sprockets varying from 13 in. to 30 in. dia., and elevations of 30-45-50-60 and 80° are developed through a standard 50 in. radius, rise or fall.

* * *

Wider Scope for Gravity Conveyors

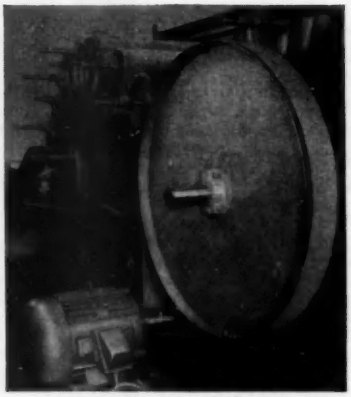
A development announced by Dexion Ltd., is a specially treated nylon glide-wheel. Designed for operation without the bush assembly normally found in conveyor wheels, it is weather-proof and non-corrosive. The material is hard-wearing and the wheel has a long working life. The nylon wheel is said to retain all the advantages of its steel predecessor, which has enjoyed outstanding success in industrial plants all over the world. Every conveyor can be tailor-made;



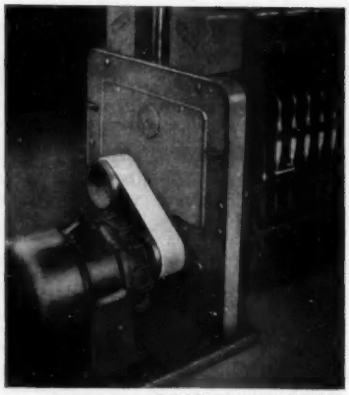
(right) A recent addition to the weaving department of the Manchester College of Science and Technology is a Picanol 86 in. reedspace Model CL-C high speed "President" loom, equipped with "Unifil" winder, weaving at 155 picks/min. A 46 in. reedspace Model CC-C "President" with circular battery weaving at 225 p.p.m. was installed at the college two years ago

There's not much....

MAIN DRIVE

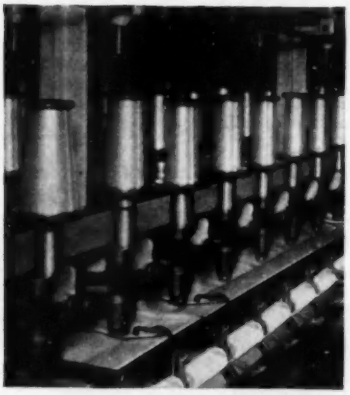


CARDING ENGINE DRIVE

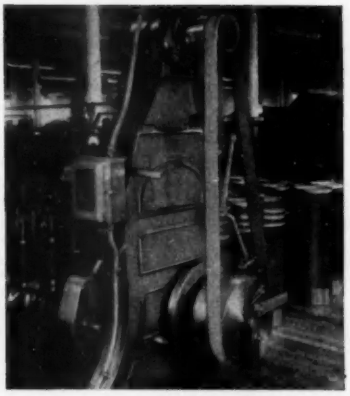


RING FRAME DRIVE

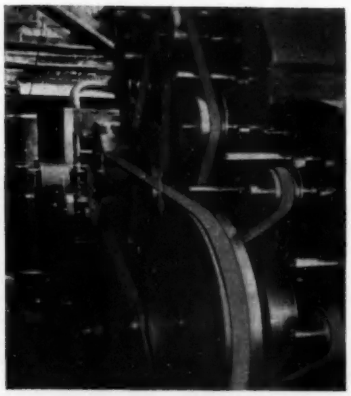
....you can't do with....



UPTWISTER DRIVE



FAST/LOOSE DRIVE



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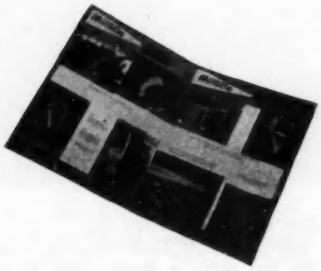
MIRACLO is the most efficient and versatile of all transmission belts. Thousands of MIRACLO drives are already in use on lineshaft drives, fast/loose drives, taper cone pulley drives, short centre drives, high ratio, high speed and multi-pulley drives. MIRACLO belts have a capacity ranging from fractional to over 3,000 h.p. with a speed range from 3 to 10,000 ft./min.

This booklet has been specially produced for the Textile industry and contains over 40 photographs of MIRACLO applications on textile machinery. It will prove the unquestioned superiority of MIRACLO over other types of flat belts and V-Drives.



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bends and curves cost no more than straight runs; lengths, width, height and load-bearing capacity can be varied. The manufacturers say the inertia of the ½ oz. nylon wheel is improved over that of the previous ball-bearing wheel, and the generous proportions (dia. 2·312 in. width ¾ in.) afford a wider load-bearing surface which, it is stated, gives better tracking on shallow gradients and smooth gentle conveyance for quite soft containers.

As with Dexion's earlier unit, the nylon version is designed for use in association with the company's range of slotted angle but, being completely weather-proof, it now makes the permanent outdoor gravity conveyor a practical proposition—by using the new wheel in conjunction with Dexion's galvanised angle. Some indoor conveyors, too, will be improved where, as in laundries and processing plants, they would normally be subject to atmospheric or chemical corrosion.

* * *

Tweeds for Vancouver

Two cloths made by A. and J. Macnab Ltd., Edinburgh, have been selected by the Council of Industrial Design for inclusion in a display of British wool cloths at the British Columbia International Trade Fair which opens in Vancouver on May 3. One is a 11/12 oz. Shetland type sports jacketing in dark grey with darker stripes; the other is a 15 oz. saxony sports cloth in the Fannich design—red, white and black checks on a neutral-coloured background. The cloths will be shown as part of a display of British consumer goods arranged by the Board of Trade. The Fair, the second of its kind, is sponsored by the Government of British Columbia.

* * *

College Testing Facilities

The textile testing laboratories in Blackburn Municipal Technical College have for many years provided a service to industry and many firms are fully aware of the facilities provided. In recent years the accommodation and equipment have been considerably improved enabling a much wider range of work to be undertaken. The Ministry of Aviation recently gave formal approval for the laboratories to operate as a test house for the physical testing of fabrics, light cords and yarns (including size content determination) under Part III of their system of "Approved Firms Inspection".

* * *

Plans for Jute Firm

Plans have been completed for a change of organisation within the Robertson Industrials Textiles group, Dundee. From March 1 four of the companies in the group operates as a single unit known as Unijute Ltd. The companies concerned are J. F. Robertson Ltd., South Anchor Ltd., M. and C. Hill Ltd., and South Anchor (Sales) Ltd. Their production and sales services will be carried on directly by Unijute whose head office is at Park Mill, Dundee. Mr. L. F. Robertson, managing director of Unijute, said "Plans have now been completed on schedule. They will result in a new standard of marketing service throughout the country. New branch offices have been opened at Leeds and Glasgow to supplement the existing ones at London, Liverpool and Kidderminster. Our customers have all been advised of the change, and we are sure that they will benefit. All the equipment and production facilities of the four former companies as well as their sales departments will be streamlined in the Unijute organisation. No changes in personnel have been made except where it has been necessary to take into account our additional branches and expanded service".

* * *

To See Sudan Cotton Industry

From Sudan, Barclays Bank D.C.O. report that the Government has agreed to issue invitations to leading personalities in the following countries to visit Sudan to enable them to have a first-hand knowledge of the country and to see the various aspects connected with cotton production: U.K., Italy, Austria, Spain, Switzerland, Federal Republic of Germany, U.S.S.R., Czechoslovakia, Yugoslavia, China, India and Japan.

* * *

Dyeing Protein Fibres

In these days when new fibres attract most of the attention, it is of great interest to realise that the older fibres can still look forward to a secure place in the textile usage, observes Mr. J. Waller, Ph.D., A.R.I.C., and Mr. G. W. Lewis, A.T.I., (Courtaulds Ltd.,) writing on the dyeing of protein fibres in the current issue of "Review of Textile Progress" published by the Textile Institute and the Society of Dyers and Colourists in conjunction with Butterworths Publications Ltd.

Reference is made to a promise of quicker, cheaper and more continuous methods of dyeing wool, and experiments have been carried out on the continuous dyeing of wool in many forms by means of standard continuous methods, it is noted. These have not been entirely successful and the usual short run in wool processing is a limiting economic factor. While the production of level, solid dyeings is still the primary aim of the dyer, attempts are periodically made to produce tone-in-tone and multi-coloured dyeings in one dyebath. Two such methods, one depending on irradiation with ultra-violet light and the other on the use of a chemical pre-treatment are mentioned.

* * *

Felt and Non-Woven Fabrics

As late as 1959 recipes for stiffening in the manufacture of men's hats were being given which must have passed out of use at the turn of the century. This information is given by Dr. T. Barr, B.Sc., Ph.D., F.R.I.C., F.T.I., F.S.D.C., (Director of Research, British Hat and Allied Feltmakers Research Association) in an article on "Felt and Non-Woven Fabrics" in the "Review of Textile Progress" published by the Textile Institute and the Society of Dyers and Colourists in conjunction with Butterworths Publications Ltd., "The dyeing of felt still presents a problem to the hat manufacturer striving for improved fastness properties. Such difficulties invariably lead to comparisons of the dyeing of wool, which presents no problen, with fur", Dr. Barr writes.

Materials manufactured with specific properties have resulted in non-woven fabrics being recommended or claimed as substitutes for existing materials. These range from interlining materials which may be given a crease-resistant finish to surgical bandages and pads and their after-treatment to render them antiseptic or bacteriostatic. Other non-woven products include decorative ribbons and tapes, pile fabric, leather substitutes, and flexible resilient insulating materials.

* * *

Mill Project in Nigeria

A new textile mill is to be constructed on the Ikeja industrial estate in the Western Region at an estimated cost of £1¼ million reports Barclays Bank D.C.O. from Nigeria. The mill, it is stated, will ultimately employ nearly 1,000 Nigerians and produce 18 million yds. of cloth per year. Production is expected to commence in 1962. The mill will have separate sections for spinning, weaving, bleaching, printing and finishing.

* * *

Higher Promotion Levy Sought

Australia's consumption of wool had recovered 25% in the past 12 months, said Sir William Gunn (chairman, Australian Wool Bureau), speaking of the Bureau's plan to provide growers with impartial facts on the world wool situation during the present levy campaign.

Australian woolgrowers now paying 5*s*. a bale levy (Australian currency) for wool promotion plus 2*s*. for research, are being asked to increase their wool promotion contribution to 10*s*. a bale for the next two years, rising eventually to a total contribution of 20*s*. a bale in 1966. Total Australian consumption represented only about 5% of the Australian wool clip, said Sir William. The rest was sold overseas. Sir William will address woolgrowers at 14 mass meetings throughout Australia during February and March. He aims to give the greatest possible number of wool men a first-hand outline in detail of the new world-wool promotion plan.

New Companies

Dawes and Co. (Nelson) Ltd. Private. Reg. Dec. 8. Capital £15,100. Cotton spinners and doublers. P. J. Andras and R. F. Lloyd. Solicitors: Lovell, White and King, 1 Serjeants Inn, E.C.4.

Amber (Continental Textiles) Ltd. Private. Reg. Dec. 5. Capital £1,000. Dealers and merchants in cloth. N. I. Amber, K. W. Johnson. Reg. Office: 33 King Street, E.C.2.

Fenchurch Distributors Ltd. Private. Reg. Dec. 22. Capital £1,000. Manufacturers and distributors of textiles. H. W. G. Hambrook and D. W. Hambrook, 4 Warrior Square, St. Leonards-on-Sea.

Francis Willey (Synthetics) Ltd. Private. Reg. Dec. 23. Capital £100,000. Manufacturers of synthetic yarns and textiles. M. Brothwood, A. L. Bryce. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

Woollen Spinners and Doublers (Huddersfield) Ltd. Private. Reg. Dec. 28. Capital £20,000. G. C. Wood, J. Booth. Registered Office: 3 and 4 Kirkgate Buildings, Huddersfield.

Schuller Maco-Glas Ltd. Private. Reg. Dec. 28. Capital £2,000. Manufacturers of glass fibres. G. C. D. Biss, D. Winter, W. H. W. Schuller. Registered Office: John M. Winter and Sons, 2 Serjeants Inn, E.C.4.

R. T. Salter (1961) Ltd. Private. Reg. Jan. 2. Capital £5,000. Spinners, weavers, bleachers, etc. J. L. Perkins, P. V. Rowan. The directors are: A. D. Campbell, H. Holt, R. E. Strangeway and D. Fogg. Solicitors: Grundy, Kershaw and Co. Manchester 2.

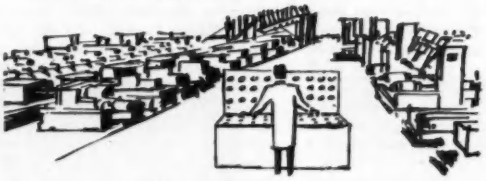
Thomas Crabtree (Colne) Ltd. Private. Reg. Jan. 16. Capital £12,000. Makers-up of cotton, worsted, woollen, etc. fabrics. T. F. Parsons, M. Bolton, A. Parsons and W. Scatcherd. Registered Office: Vivary Bridge Mill, Colne, Lancs.

Mills and Fountain Ltd. Private Reg. Jan. 13. Capital £10,000. Woollen and cotton merchants. D. G. Mills, L. Mills and J. B. Mills. Registered Office: Heybrook Warehouse, Hamer Lane, Rochdale.

Electric Motors & Controls-2

Control equipment must enable the motor to be operated effectively, to obtain maximum productive efficiency of a given machine. An outstanding advantage of individual electric drives is the flexibility of control available. Control equipment may be manual, semi-automatic or fully automatic, and includes gear for the following operations:

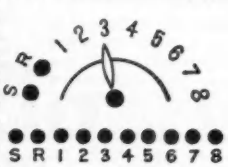
(a) Starting
(b) Speed Control (this subject will be dealt with in Data Sheet No. 16)
(c) Reversing
(d) Stopping
(e) Switching off automatically if operating conditions become abnormal
(f) Isolation of motor and control equipment from the supply.



Every application of power has its own particular control requirements—and they are legion. Below are featured four uses of electric motors and their controls; they are given only as examples and represent but a small fraction of the whole picture.

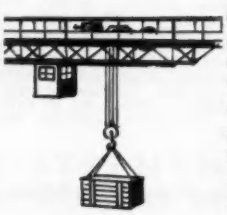
Turret-lathe Control

Various speeds are required for different tools, and it is possible to arrange, for instance, for a four-speed headstock, forward and reverse, incorporating a power-operated pre-selector speed change. By using a two-speed double-wound motor, eight speeds forward or reverse are obtainable. A dial on the headstock is set to the required speed and when a knob in the centre of the dial is pressed, the power-operated mechanism changes the speed instantly.



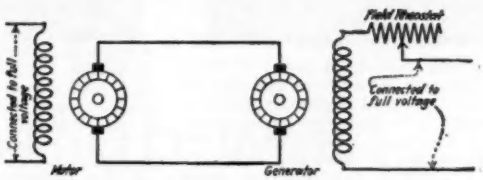
Crane Control

This is a form of control which must be flexible yet completely foolproof. It is, for instance, possible to arrange for motor switching to be performed by contactors in response to movement of the crane driver's master controller which has a number of notches, each of which is associated with a particular set of contactors for acceleration, speed control, reversing and braking. If the controller is moved quickly from the 'off' position to the 'last point lowering', the rate of acceleration is limited automatically by the relays. These also govern the retardation in order to prevent a heavy descending load being stopped too suddenly. This is just one of the ways in which electric control mitigates the hazards of crane operation.



Planing-machine Control

Another example of motor control for machine tools is that for planing machines. For general workshop machining, the Ward-Leonard controlled motor, with a speed range of 10 to 1, gives a rapid and smooth reversal of the table travel and is ideally suited for short-stroke work. Two arrangements of Ward-Leonard control are available, the 3-machine set with generator, exciter and driving motor, and a specially designed 4-machine set with an additional auxiliary exciter. With the 3-machine set the control



equipment can include magnetic time relays which automatically adjust a regulator to strengthen the motor field at the instant of reversal and therefore greatly increase the accelerating torque. The auxiliary exciter of the 4-machine set automatically provides 'field forcing' on the generator; in other words, the power input to the motor is increased to give more accelerating torque at the instant of reversal.

Automatic Control

The control equipments described incorporate automatic features which help considerably towards obtaining safe and efficient operation of the driven machine, but much still depends on the human element. Braking equipment, for instance, cannot always become effective until an operative has taken some action. In an emergency this physiological time lag which delays the initial action will also delay the final effect. Fortunately it is often practicable to employ devices, which will be described in other Data Sheets, to 'observe' any abnormal condition and immediately and automatically to initiate the braking system.

Particular attention should be paid to the positioning of controls. When a machine, or group of machines, requires a large number of push buttons and, in some cases, instruments, etc., the controls can be grouped on a desk with a mimic diagram, located in a position where the operator has full view of the work.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. TEMple Bar 9434.

They can offer you excellent reference books on electricity and productivity (8/6, or 9/- post free)—'Electric Motors and Controls' is an example.

E.D.A. also have available on free loan within the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

7918

RECENT TEXTILE PATENTS

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828,696 Improved Materials from Blended Fibres

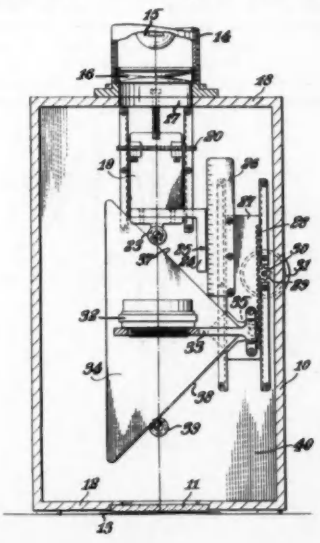
RADUNER & CO., A.-G., *Horn, Thurgau, Switzerland.*

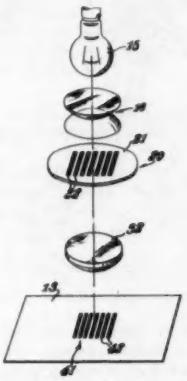
A process for improving the characteristics of material composed of yarns containing at least two fibre components, by accumulating permanently any desired fibre component on the surface of the yarns without loss of dimension. The material is subjected to the action of chemical agents or heat producing shrinkage of the fibre component to be accumulated in the interior of the yarns but not of the other fibre components, whereupon mechanical pull is applied to the material, either during treatment or preferably after shrinkage has taken place, preferably prior to, but if desired, also after the shrinking agent has been made ineffective. The mechanical pull is applied in the direction where shrinkage has taken place and of such strength that the original dimensions of the material are regained. In the course of further finishing operations the material is preferably treated in tensioned or untensioned state with known agents producing dimensional stabilisation of one or more of the fibre components.

829,690 Determining Thread Spacing Etc.

BRITISH RAYON RESEARCH ASSOCIATION, *Manchester*, AND COOKE TROUGHTON AND SIMMS LTD., 163 *Stretford Road, Manchester.*

Apparatus for determining linear planar spacing in periodic structures, and has particular application for the determination of the spacing of the wires of a loom reed or to determine the thread spacing in fabrics. The device comprises a housing 10 having a transparent window 11 in its base 12 and in one wall an angular viewing window (not visible in the drawings) permitting a structure 13 below the window 11 to be viewed. Mounted on the top of the housing is a lamp casing 14 which encloses a 15 watt, 6 volt lamp 15 and a condenser lens system 16 which projects light from the lamp 15 through an aperture 17 in the top 18 of the housing.



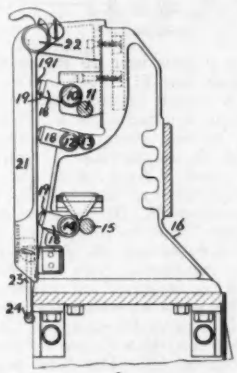


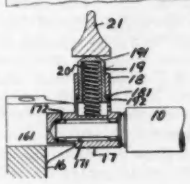
Below the condenser lenses and mounted for vertical displacement is a carriage 19 for a horizontal graticule 20, this being in the form of a transparent plate 21 having a series of parallel lines 22 at a predetermined spacing. A supporting roller 23 is secured to the carriage for rotation about a horizontal axis, and also secured to the carriage is a depending scale plate 24 providing a vertical edge 25 which is in abutting relationship with a second vertical scale plate 26. This scale plate 26 is secured to a projecting lens carriage 27 which is mounted for vertical movement inside the housing, a rack 28 on this carriage being engaged by a toothed wheel 29 on a spindle 30 which is rotatable by a suitable knob 31. A lens 32 is supported in a horizontal position between the graticule 20 and the window 11 by a bracket 33 projecting from the carriage 27. Arranged on carriage 27 is a support plate 34, this being right-angled triangular in shape, with the pivot 35 adjacent the right-angled corner. The plate 34 is arranged with one of its sides 37 extending upwards beneath the graticule carriage 19, the roller 23 of the latter resting on such side 37 so that the carriage 19 is supported by the plate 34. The other side 38 of plate 34 extends downwards and rests on a stationary roller 39 which is journalled in a wall 40 of the housing. To determine the spacings of the threads of pieces of woven fabric 13, the apparatus is used in the following way. The piece of fabric is placed upon a flat surface and the apparatus is placed with the window 11 over the fabric and this is then viewed through the side window of the apparatus. The arrangement is then adjusted to ensure that the lines 22 of the graticule 20 are parallel to the threads to be counted. The knob 31 is then rotated, this causing the lens carriage 27 to move vertically, and the tri-angular plate 34 to be pivoted about its pivot on the lens carriage 27, so causing a corresponding vertical movement of the graticule 20 according to the angular position of the plate 34, to enlarge or diminish the size of the image 41 produced by the optical system on the fabric 13, until the lines 42 of the image correspond with the threads to be counted.

829,829 Improved Roller Weighting

T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

A device whereby a radial loading force may be applied to the journal or arbour of a machine roller. The embodiment illustrated is provided with three pairs of drafting rollers, 10, 11; 12, 13; and 14, 15, all of which are supported between spaced pairs of brackets 16. The "bottom" rollers 11, 13 and 15 are mounted in conventional bearings, whilst the "top" rollers are carried in bearing blocks 17 which are shaped so as to be capable of sliding in a direction normal to the axis of the roller between parallel guide surfaces 161 of the brackets 16. Each bearing block has a bore 171 for reception of the roller journal, and needle-roller bearings, 172, may be provided. Formed integrally with bearing block 17 is an extending tube 18, fitting telescopically, upon or within which is a second tubular member 19 closed at its outer extremity. Telescopic members 18, 19 together form a housing in which is enclosed a compression spring 20, disposed so that when compressed by pressure applied to the end 191 of the member 19, the spring will



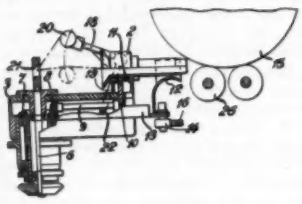


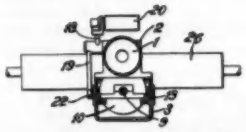
exert upon the roller journal a loading force acting normally to the roller axis. The member 19 is arranged to slide within member 18, an external shoulder 192 upon the inner extremity of the former being adapted to abut against an internal shoulder 181 in the latter, thereby providing means for preventing separation of the parts of the housing and ensuring that the spring is protected against dust or foreign matter. The means employed for applying pressure to the spring loading unit is an arm 21 pivoted upon a cross-member 22 extended between two adjacent brackets 16 and arranged when locked in the operative position by a catch 23 to bear against the end 191 of member 19. For this purpose the latter may be domed to provide a bearing surface for arm 21. Two adjacent arms 21 are connected by a handle 24 so that both may be operated together by one hand.

830,206 Winding Sliver and Slubbing on Cross-Wound Bobbins

VEB Spinnereimaschinenbau Karl-Marx-Stadt, 27 *Altchemnitzer Strasse, Karl-Marx-Stadt, Germany.*

A device having a swing funnel for winding sliver, slubbing, etc. on cross-wound bobbins or cheeses, ensuring that the distance between the winding point on the bobbin and the point at which the sliver is dispensed is properly maintained. The swing funnel 1 is at the same time a rotary funnel and is mounted in a bearing block 2 attached to a swing rest 3 which pivots about a vertical axis. A driven shaft 6 which, via a pair of bevel gears 7, 8 drives a horizontal shaft 9 mounted in the swing rest 3. At the front end of



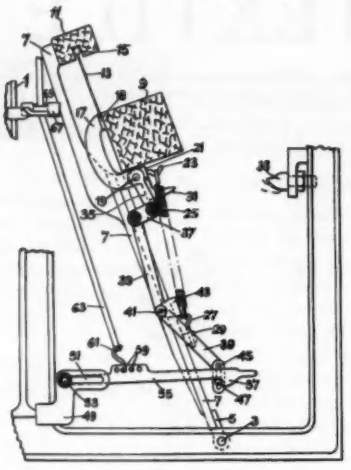


shaft 9 is a spur gear 10 which meshes with a spur gear 11, fitted to the swing funnel. A nozzle 12 associated with the swing funnel is attached to a carriage 13, mounted on the swing rest. The free front end of the carriage 13 carries a roller 14, and a fixed guide rail 16 is arranged parallel to the bobbin 15 or the drive rollers 26. By means of springs the carriage 13 or its roller 14 is forced against the guide rail 16. As the funnel swings, a continuous back and forward movement is imparted to carriage 13, so that the point at which the sliver or slubbing is dispensed is always in the same relative position vis-a-vis the longitudinal axis of bobbin 15. The feed point is represented alternately by the mouth of the swing funnel itself and by the nozzle 12. A double lever 18, 19 is mounted on the bearing block 2 about an axis crossing the swing funnel. The arm 18 carries a guide pulley 20 for the sliver which comes from the guide eye 21, and the lower arm 19 is forked and grips a journal 22 on carriage 13. Any movement of the latter consequently causes a swinging movement of lever 18, 19, thus providing satisfactory longitudinal and tensional compensation for the sliver or slubbing.

830,508 Loom Terry Motion

G. Schebesta, *Caledonia Engineering Company, Caledonia Works, Derby Street, Burnley.*

Relates to a loom terry motion for use on a loose reed loom. The loom having a loose reed which is normally held in a "fast" position as the sley moves forward on the beat-up, is provided with a link mechanism which is operated by a dobby controlled member, operation of the link mechanism causing release of the reed. Preferably the link mechanism comprises a two armed lever pivoted to the sley sword, and connected at its upper end to a link fixed to the reed shaft, the two armed lever being adapted to be selec-

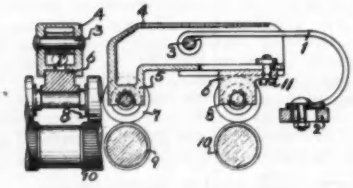


tively turned or not turned by engagement with a dobby controlled hook member. In operation, assume it is required to have a "fast" reed every third pick, the dobby will cause the connector 63 to be pulled every third pick, and hook member 55 will be raised so that catch 57 does not engage pin 47. Consequently as the sley moves forward, heater 31 engages the underside of bunter 33 and the reed is locked "fast" by pressure members 17. On the other picks, the dobby does not pull connector 63 and therefore hook member 55 is not raised, so that as the sley moves forward, catch 57 engages and holds pin 47. Further forward movement of the sley sword causes lever 39 to be turned and this causes link 37 to be pushed forward thereby turning reed shaft 19 in an anti-clockwise direction. The turning movement imparted to shaft 19 by lever 39, the link 37 and the arm 35, is sufficient to lift the nose of the heater above the bunter, so that, as the sley approaches forward position, the heater is turned to turn the reed shaft in an anti-clockwise direction. This will cause the pressure members to be turned, bringing their upper ends rearwards and releasing pressure on the reed casing so that the reed becomes "loose."

830,614 Loading Device for Pressure Rollers

Wuertt. Spindlefabrik G.m.b.H., *Suessen, Germany.*

An improved loading device for pressure rollers of spinning machines, etc. In one example, a leaf spring 1, which is mounted on a crossbar 2 disposed behind a drawing mechanism presses down and locates a pin 3 mounted in a saddle 4 having a fixed bearing 5 and a displaceable bearing 6 in which run pressure rollers 7 and 8. Clearance between the two pairs of pressure rollers is made by means of the bearing 6, which is fixed in desired position by set screw 11. The position of the saddle in which are mounted the



pressure rollers relative to the bottom rollers 9 and 10, is determined in the horizontal plane by the leaf spring 1 alone. Laterial positioning of the rollers is brought about by abutment of the leaf spring against the side walls of the saddle 4.

830,687 Cop Changing Mechanism for Looms

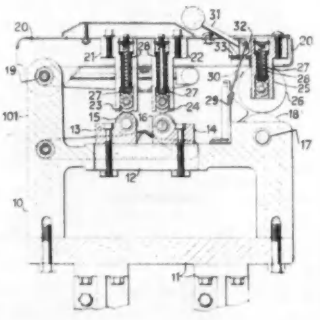
Ateliers Houget Societe Anonyme Verviétoise Pour La Construction De Machines, 2 *rue Fernand Houget, Verviers, Belgium.*

A two or more shuttle loom with automatic weft supply comprising two cop sensing devices, two cop-changing mechanisms and a set of two shuttle boxes mounted, with their driving members, on each side of the sley. The main object is to effect automatic changing of the cops, without stopping the loom during weaving with two shuttles pick and pick, and for all the combinations of arrangements of picks in two or more colours, while still permitting the alternation of even and odd picks. The two boxes are designed in such a manner as to comprise a front loading or charging compartment and one or more rear compartments. There is provided on each side of the loom a cop distributor magazine with which the corresponding cop-changing mechanism co-operates in such a manner that when a sensing device has indicated the need for renewal, the replacement of the empty cop is effected when the shuttle associated with the yarn of the colour in use appears in the front compartment of the shuttle box opposite the feed orifice, the front compartment being in a position of alignment in relation to the reed.

830,991 Comber Draw-Box

T.M.M. (Research) Ltd., *Hartford Works, Oldham.*

Describes the draw-box of a combing machine which has improved means for supporting the upper drawing and calender rollers. The draw-box comprises a stand 10 for mounting on the comber frame 11 and including spaced members 12 on which are carried adjustable bearing blocks 13, 14 for the lower drawing rollers 15, 16 and, at the front, fixed bearings 17 for the lower calender roller 18. The stand has upright extensions 101 forming bearing brackets between which is fixed a transverse pivot shaft 19. Upon shaft 19 are mounted two arms 20 extending over the lower roller bearings and spaced apart by a distance exceeding the combined width of the combed slivers delivered from the combing heads. Arms 20 are provided with bearing-blocks 21, 22 in which the respective arbors of the upper drawing rollers 23, 24 are received, and



which can be adjusted to permit the upper roller spacing to correspond with that of the corresponding lower rollers. A further pair of bearing blocks 25 is provided at the ends of arms 20, in which the arbors of the upper calender roller 26 are received. Each of the bearing blocks 21, 22 and 25, houses a slidable plunger 27 which is urged by a compression spring 28 to bear upon the roller arbor, and when the arms 20 are locked in their operational position, springs 28 are energised to impart to the rollers the required degree of downward loading. The arms 20 are locked in operational position by catches 29 which are fixed to the stand 10 so as to project behind the roller 18 and there to be engaged by hooks 30 carried upon levers 31. The levers 31 are combined with cams 32 which, when the levers are pivoted in a fore-and-aft direction, co-operate with fixed surfaces 33 and are thus effective to lower the hooks 30 into, or raise them from locking position. The levers 31 of both arms 20 may be connected by a cross-bar to enable the operator to manipulate both together with one hand.

831,031 Explosive Powered—Shuttle Propelling Mechanism

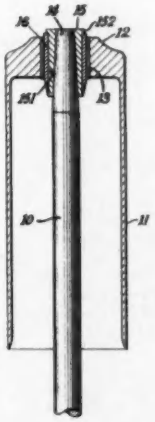
AMERICAN VISCOSE CORPORATION, 1617 *Pennsylvania Boulevard, Philadelphia, Pennsylvania, U.S.A.*

Relates to explosive powered shuttle driving mechanisms for looms, particularly as described in B.P. Nos. 759,562 and 776,100. In the present modification the explosion is initiated by means actuated by the movement of the shuttle, and there is provided an arrangement for effecting a predetermined delay between actuation of the explosion initiating means and the explosion. Means are also provided for partially absorbing the explosive impact so as to limit the initial speed at which the shuttle is propelled.

831,140 Reduction of Vibration on Cap Spinning Spindles

PRINCE-SMITH AND STELLS LTD., *Keighley.*

Improved cap spinning and twisting machines in which the wear between the cap and the part of the spindle by which it is supported is reduced. 10 indicates the upper part of the spindle blade and 11 the cap, which is provided with the customary boss 12 having a bush 13. Housed in the bush is a conically bored metal bush 15 which has a cylindrical surface 151 and a terminal flange 152,

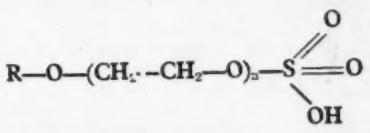


and a sleeve 16 of synthetic rubber is interposed between bushes 13 and 15, the sleeve 16 being retained in position by the flange 152. The tip of the spindle blade is made frustoconical at 14 to mate with the conical bore of bush 15. The presence of the resilient sleeve 16 prevents the transmission of vibrations from the spindle 10 to the cap. Doffing and donning of the cap may be facilitated by making the sleeve 16 and bush 15 as a permanent component of the cap.

831,220 A Method of Improving the Wetting Capacity of Mercerising Liquors

CIBA LTD., *Basle, Switzerland.*

Mercerising liquors having very good wetting properties, and which have no tendency to get at high liquor concentration and low temperatures, and of which the tendency to foam is considerably reduced. These effects are obtained by incorporating with the liquors, an ethylene or poly-ethylene glycol ether sulphuric acid ester which contains at least 7 carbon atoms and corresponds to the formula



in which R represents an aliphatic residue, a cycloaliphatic residue or an aliphatically bound aralkyl residue, which residues contain 3—10 carbon atoms, and *n* represents a whole number not greater than 5, or a salt of such ester, and also at least one branched chain aliphatic monohydric alcohol containing 8 or 9 carbon atoms, and, if desired, also a further sparingly water-soluble alcohol containing at least 5 carbon atoms, and if desired, a solution promoter. In one example, there are added to a sodium hydroxide solution of about 30° Bé intended for use in a yarn mercerising machine, 4—10 cc., per litre of the solution prepared from 70 parts of solution containing 37% of the sodium salt of the sulphuric acid ester of diethylene glycol mono-*n*-butyl ether, and 6 parts of isoctyl alcohols, and 4 parts of ethylene glycol monoethyl ether. Raw unboiled cotton yarn is mercerised in the mercerising liquor so prepared, and no troublesome foam is formed. In another example the procedure is the same as described in Example 1, except that 4—10 cc. of a solution of the following composition are used: 66 parts of solution containing 39% of the sodium salt of the sulphuric acid ester of diethylene glycol monobutyl ether; 5 parts of isooctyl alcohol; 2 parts of 2-ethyl-butanol; and 4 parts of triethylene glycol. Raw unboiled cotton yarn is rapidly mercerised by the mercerising liquor so prepared, and no troublesome foam is formed.

831,419 Thread Tensioning in Shuttles

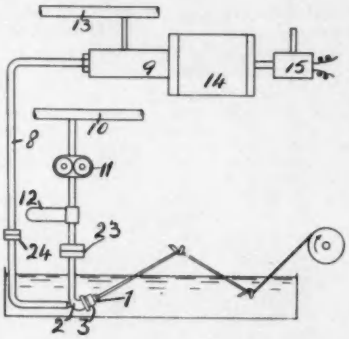
H. HELD AND C. WAGNER, *Reutlingen-Betzingen, Hoffmannstrasse* 12, *Western Germany.*

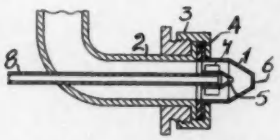
A weft thread tensioning device comprises two abutting spring-loaded tension plates, the abutting surfaces of which are provided with diagonal linear grooves inclined down in the direction in which the weft thread is drawn off a cop and contrived to urge the weft down to a limiting pin while the shuttle is in operation. The tension plates are provided with U-shaped sliding members which are located in a U-shaped body and ensure that the tension plates are maintained parallel to one another, to increase the stability of the plates.

831,434 Production of Slub Yarns

COURTAULDS LTD., *London*

Relates to the production of yarns of irregular denier. A conical spinning jet 1 is secured to a rounder end 2 by a screwed coupling 3, a seal being formed by the rubber ring 4. A nozzle 5 is supported behind the face 6 of the jet by radial centering members 7. The nozzle is connected by a pipe 8 in which is a strainer 24, to an injector type pump 9 as described in B.P. No. 812,022 which delivers coloured viscose in sharply defined pulses at a pressure higher than that of the clear uncoloured viscose supplied at a uniform rate through the rounder end.





The lip of nozzle 5 is not more than three thirty-secondths of an inch behind the face of the jet 6. The rounder end 2 is supplied with viscose from a supply line 10 by a gear-type metering pump 11 through a candle filter 12 and final filter 23. The injector pump 9 draws coloured viscose from a supply line 13 and may be actuated by a cam or by a pneumatic piston in the cylinder 14, the supply of air being controlled by an electro-magnetically operated valve 15. To obtain sharp changes in colour, elasticity in pipe 8 must be reduced to a minimum, and for this reason the pipe is made rigid and as short as possible, say one eighth of an inch bore and 20 inches long, and there is no filter but only the strainer 24 between the pump 9 and the nozzle 5. The jet 1 is immersed in a dilute acid regenerating bath 16 and the threads are taken via guides 17, 18 to a godet or other take-up device 19. The guide 17 has the effect of preventing the slubs in the various individual filaments from moving longitudinally and thus becoming out of place.

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Further particulars may be obtained from the Head of the Department of Textile Industries, Bradford Institute of Technology, Bradford 7, to whom application for admission should be made.

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THE Proprietor of British Patent No. 740287 is prepared to sell the patent or to licence British manufacturers to work thereunder. It relates to "Improved Blanket and napped material therefor." Address: Boult, Wade and Tennant, 112 Hatton Garden, London, E.C.1.

THE Proprietors of British Patents Nos. 699633, 699657 and 717646 are prepared to sell the patents or to license British manufacturers to work thereunder. They relate to "Improvements in or relating to Pile Fabrics and Methods of Manufacturing same", "Improvements in or relating to a Machine for Manufacturing a Reversible Pile Fabric" and "Improved Method of and Apparatus for the Production of Reversible Pile Fabrics" respectively. Address: Boult, Wade and Tennant, 112 Hatton Garden, London E.C.1.

THE Proprietor of Patent No. 718274 for "Improvements in Woven Fabrics," desires to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine, Lake and Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2.

PATENT No. 758191 entitled "Self-Actor Mule for Spinning Yarns" is for sale or licence. For details apply to Chatwin and Company, Chartered Patent Agents, 253 Gray's Inn Road, London E.C.1.

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